WAGENINGEN WORLD

MAGAZINE OF WAGENINGEN UR ABOUT CONTRIBUTING TO THE QUALITY OF LIFE

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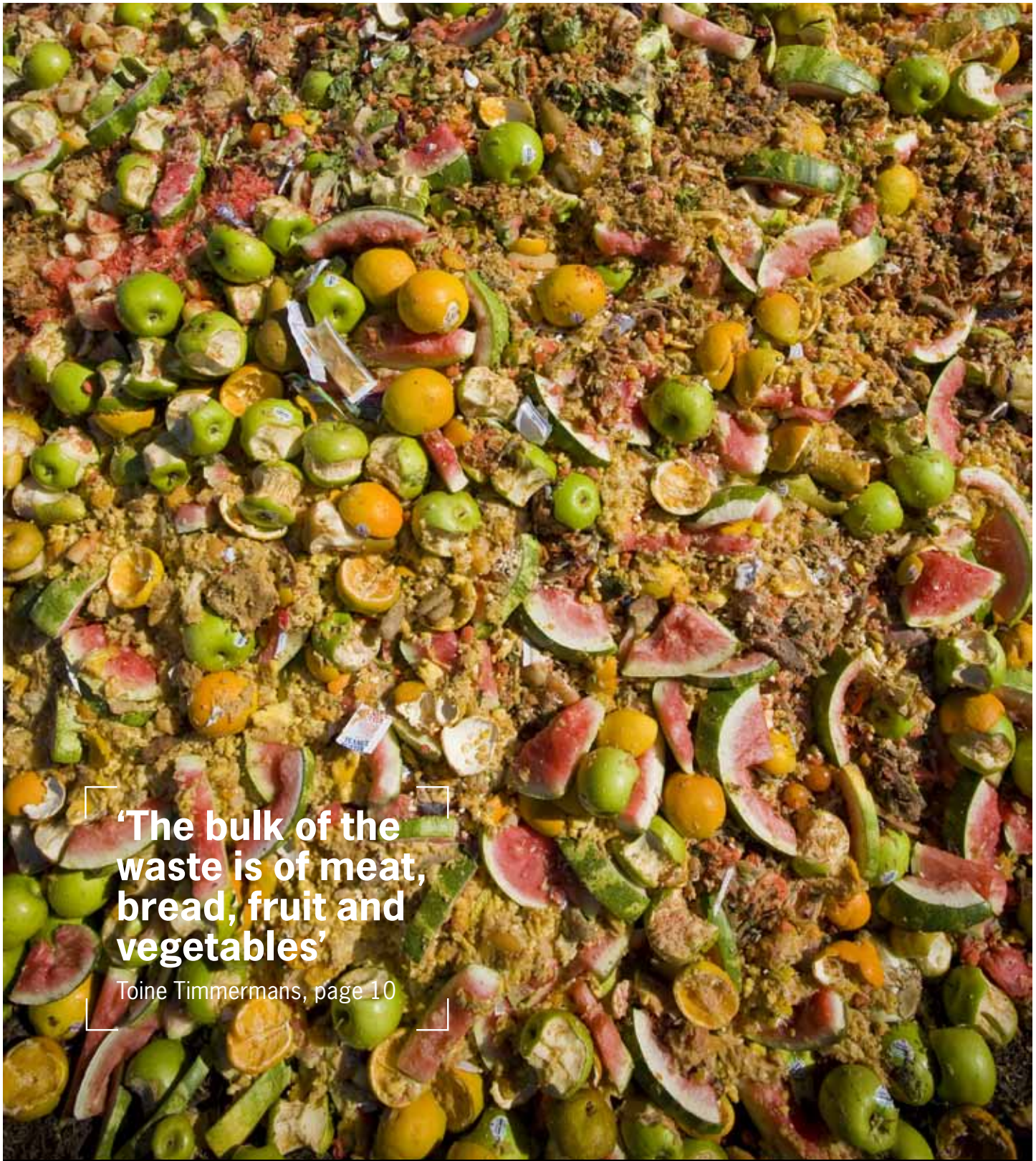

‘The bulk of the waste is of meat, bread, fruit and vegetables’

Toine Timmermans, page 10

The power of the **root nodules** | Capitalizing on **history** | Thiopaq extracts **sulphur from biogas**
New: **rubber from dandelions** | The limited value of **arguments** | Racing through **DNA**

WAGENINGEN UR
For quality of life

COLOPHON Wageningen World is the quarterly magazine for associates and alumni of Wageningen UR (University and Research centre) and members of KLV, the Wageningen Alumni Network. A PDF version of the magazine can be found at www.wur.nl/UK/publications/Periodicals **Publisher** Wageningen UR, Viola Peulen, **Editorial Board** Paul den Besten, Hans Bothe, Ben Geerlings, Wilbert Houweling, Bert Jansen, Jeanette Leenders, Jac Niessen, Judith Pierik, Helene Stafleu, Erik Toussaint, Delia de vreeze, Brenda van der Zee **Editors-in-chief** Gaby van Caulil (redactie Resource), Pauline Greuell (Corporate Communicatie Wageningen UR) **Magazine editor** Miranda Bettonville **Copy editor** Rik Nijland **Alumni news** Alexandra Branderhorst **Translation** Clare Mc Gregor, Clare Wilkinson **Language editor** Clare McGregor **Art direction and design** Jenny van Driel (Wageningen UR, Communication Services) **Cover picture** Getty Images **Overall design** Hemels Publishers **Printer** Mediacenter Rotterdam **ISSN** 2212-9928 **Address** Wageningen Campus, Akkermaalsbos 12, 6708 WB Wageningen, PO Box 409, 6700 AK Wageningen, telephone +31 317 48 40 20, wageningen.world@wur.nl **Change of address alumni** www.wageningenalumniportal.nl **Change of address associates** (mention code on address label) wageningen.world@wur.nl **Change of career details** alumni@wur.nl

The mission of Wageningen UR (University & Research centre) is 'to explore the potential of nature to improve the quality of life'. Wageningen UR includes nine specialist applied research institutes, Wageningen University, and Van Hall Larenstein University of Applied Sciences. These institutions have joined forces to contribute to finding answers to crucial questions related to healthy food and and living environment. Wageningen UR has a staff of 6,500, 10,000 students, 35,000 alumni and 40 sites, with a turnover of 662 million euros. Institutes of Wageningen UR: Alterra, LEI, Plant Research International, PPO, Wageningen UR Livestock Research, Central Veterinary Institute, Wageningen UR Food & Biobased Research, IMARES and RIKILT.

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PHOTO HARMEN DE JONG

Alien viruses

'It seems as though we have faced several new animal diseases over the last few years. Now it is the Schmallenberg virus, and we have already had bluetongue disease and Q fever. But this is only partially true. Q fever has caused a lot of concern in the Netherlands in the last three years, but it is not in fact a new disease. Bluetongue disease, on the other hand, was a newcomer on the scene in 2006, at least in Europe. We were familiar with the virus from outbreaks in other parts of the world. This is not the case with the Schmallenberg virus, which has been causing congenital deformities in cows, sheep and goats this winter. Its genetic characteristics reveal this new pathogen to be an Orthobunya virus with relatives in eastern Asia, Australia and Africa. These viruses primarily infect ruminants. For the time being, we are assuming that the Schmallenberg virus will spare human beings, but we cannot be 100 percent certain. A virus can mutate.
'How this virus ended up in Europe remains a puzzle. It may have arrived with an imported animal. Another possibility is that an infected vector (the carrier of the virus) found its way to Europe. In view of its similarity to other Orthobunya viruses, we think that biting midges were the main vectors, but mosquitoes cannot be ruled out either.
'The bluetongue virus is transmitted by insects too. It could be that changes in the geographical range of insects, possibly in response to climate change, play a role in the appearance of this virus that is new to us. But that is difficult to prove. It could also be that a vector hitches a lift on international transport that brings it to new places.
'There is precious little we can do about that. At the Central Veterinary Institute we are concentrating first and foremost on developing a sound laboratory diagnostic method for Schmallenberg infections. We definitely want to develop a vaccine as well, but that will take at least a year and a half.

Wim van der Poel, senior researcher at the Central Veterinary Institute, part of Wageningen UR

GENETICS

Prize for DNA labs

The Centre for Biosystems Genomics (CBSG) in Wageningen has received 1 million euros from the Netherlands Genomics Initiative for its work, including its innovative mobile DNA labs. These are off-the-peg experiments that enable secondary school pupils to explore DNA research. The concept was developed eight years ago in collaboration with Wageningen University, part of Wageningen UR. The CBSG will put most of the prize money towards continuing with the DNA labs and developing new experiments for it. *Info: erik.toussaint@wur.nl*

PHOTO HOLLANDSE HOOGTE

ANIMAL AND ENVIRONMENT

Ecological paw prints

Three dogs or ten cats use as much energy as one person, according to exploratory research at Wageningen UR Livestock Research on the ecological footprint of cats, dogs and horses, commissioned by the ministry of Economic Affairs, Agriculture and Innovation.

In the discussion about how to continue to be able to feed the world, so far little attention has been paid to pets and domestic animals, although they require considerable amounts of protein, calories and space. To maintain one human being in a rich country takes about 12,500 of the earth's surface. For the average cat the figure is 1,000 and for the average dog, 2,000. A horse weighing about 400 kilos requires about 3,500 square metres. Raw fodder for the horse does not compete for space with human food, but concentrated feeds do. A horse needs a lot of outdoor space too. In the Netherlands there are 192 cats per 1,000 human inhabitants, 109 dogs and 25 horses.
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FORENSIC SCIENCE

Hair as evidence

Wageningen University and RIKILT, both part of Wageningen Ur, will be contributing to forensic research with a study to be financed by Dutch research organization NWO. The researchers' aim is to improve the reliability of hair as evidence. Signs of drug abuse can be seen in the user's hair, but the presence of the relevant chemicals in the hair is often hard to prove in court, as they could also have landed on the hair from external sources. A 'chemical microscope' should make it possible to see clearly what is on the hair and what is in the hair.
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BIOBASED

Elephant grass makes Schiphol airport safer

Last December, Wageningen UR made a Green Deal with three agribusinesses from Harlemmermeer, near Schiphol international airport, and with the ministries of Economic Affairs, Agriculture and Innovation, and Infrastructure and Environment. The farmers are going to grow elephant grass close to Schiphol. This crop can be used for building material, bioplastics and fuel, but it is not an attractive habitat for geese. This makes the geese head for areas further away from the airport, which will prevent a lot of collisions with aeroplanes. *Info: vincent.kuypers@wur.nl*

NUTRITION AND HEALTH

You soon get used to low-salt bread

The amount of salt in bread could easily be halved. Low-salt bread is just as popular as standard bread and people do not put extra salty spreads on it to compensate, either.

This conclusion was reached by a team of researchers from Wageningen UR and Dutch research organizations TNO and RIVM after a study based on more than 100 test subjects. The results were published in *The Journal of Nutrition* in December.
For four weeks running, participants in the study came for breakfast every weekday in the Restaurant of the Future, a research facility run by Wageningen UR Food & Biobased Research. They were divided into three groups and served three separate breakfast buffets. Without their knowing it, one group was offered standard bread, one group low-salt bread, and one group low-salt bread with added flavour. In the bread given to the 'low-salt groups', the amount of salt was further reduced every week. Only once salt levels reached less than half the original level did people start eating less bread. And even this only happened in the group on low-salt bread without added flavour.
After the trial it emerged that most of the participants had not noticed the reduction in salt at all. Taste tests then showed that the taste buds of those given low-salt bread had adapted to it: they now liked it more than did the group that had continued to eat standard bread. Once spreads and added flavours were added to the bread, the differences in taste preferences between the groups disappeared.
This research is important because many people worldwide tend to eat too much salt, by an average of ten grams per day. Consumption of more than five or six grams per day can lead to raised blood pressure, which in turn can cause cardiovascular diseases. Four slices of bread per day provide people with an average of 1.8 grams of salt. So halving the amount of salt in bread could make a difference to many Dutch people.
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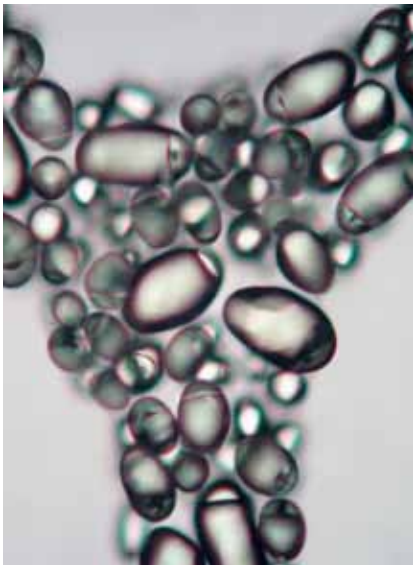
PHOTOTO ANP

LIVESTOCK

Alternative to antibiotics

Van Hall Larenstein University of Applied Sciences, part of Wageningen UR, is working with the Frisian company Mastivax on an alternative to antibiotics. The active ingredients in the product are antibodies released into their milk by cows treated with a vaccine. This usually happens straight after calving. In order to extract these antibodies from cow's milk on a large scale, the company has applied for a subsidy to fund a pilot plant. The alternative to antibiotics is intended for pigs and may later be usable for humans. *Info: info@lsrd.nl*

FOOD SAFETY



What kind of starch?

RIKILT has developed an application that can determine which plant a starch comes from. The computer programme includes all the main types of starch found in foods and animal feeds. It makes it easy to detect food contamination or fraudulent labelling with a microscope. Starch granules vary from one plant to the next. So there are thirteen questions and many illustrative photos to help users to identify starch granules. The module is part of the Determinator computer programme. *Info: leo.vanraamsdonk@wur.nl or: www.determinator.wur.nl*

ENVIRONMENT

Greenhouse horticulture is energy-efficient

Dutch greenhouse horticulture surpassed its 2010 targets for using energy more efficiently and reducing CO_2 emissions, the Greenhouse Horticulture Energy Monitor reveals. Agricultural economics institute LEI, part of Wageningen UR, publishes this monitor annually at the behest of the horticulture product board and the ministry of Economic Affairs, Agriculture and Innovation. Dutch greenhouse horticulture has all but reached the targets set for 2020 in the Clean and Efficient Agri Sectors agreement. The only area in which the sector still lags behind is in its use of sustainable energy. *Info nico.vandervelden@wur.nl*

BIOBASED

PHOTO HOLLANDSE HOOGTE

Green plastics in focus

In a Dutch-language series of books on green natural resources, an overview has recently been published of the state of the art in the field of plastics made from renewable resources: *Biobased plastics 2012*. These kinds of plastics are playing a pioneering role in the Netherlands in the transition to a biobased economy. The booklet provides insight into this fast-growing branch, and covers the main commercially available biobased plastics at present, their production, their applications and their costs. The authors end with a discussion of issues surrounding the future development of these kinds of plastics: dependence on natural resources, the influence of consumers and government policy, the lowering of production costs through cheaper production methods and broader applicability. *Biobased plastics 2012* was published by Wageningen UR Food & Biobased Research. *Info: erika.vangennip@wur.nl or: www.groenegrondstoffen.nl*

NUTRITION AND HEALTH

PHOTO NATIONAALE BEELDBANK

Healthier lifestyle prevents diabetes

People in the preliminary stages of diabetes can benefit from more exercise and a healthier diet. This approach could halve the number of people in this high-risk category who end up developing full type 2 diabetes, the most prevalent form of the disease. This finding emerged from a study by researchers at Wageningen University, part of Wageningen UR, and colleagues from Maastricht, the Netherlands. They monitored almost 150 people with 'pre-diabetes' over six years. Half the group received no advice, while the other half received help in adapting their lifestyles. 'For example, they went to see a dietician once per quarter and they were offered a free workout under supervision twice a week', explains professor of Human Nutrition Edith Feskens. GPs in the town of Apeldoorn are now helping run trials to find out whether this preventive approach works under normal conditions. *Info: edith.feskens@wur.nl*

FOOD SAFETY

Doubts about plant-based supplements

Some over-the-counter plant-based nutritional supplements contain substances that can carry health risks for humans.

Plant-based supplements are a growth market in the European Union. In order to assess their safety, researchers at Wageningen University, part of Wageningen UR, and two other European institutes analysed certain dangerous compounds that can be present in plant-based nutritional supplements. The research results were published in the November edition of *Food and Nutrition Sciences*.

The compounds selected by the researchers – chiefly alkenylbenzenes and pyrrolizidine alkaloids – may constitute a risk factor because they are known to be carcinogenic.

The man ingredients in the plant-based supplements in question were basil, fennel, nutmeg, sassafras, cinnamon or calamus, or essential oils derived from these plants. In many plant-based supplements, the levels of alkenylbenzenes found were too low to pose a health threat, but a few supplements did contain relatively high levels of alkenylbenzenes. The recommended dosages of these products deliver a daily dose of alkenylbenzenes that is enough to cause tumours in lab animals. The researchers therefore appeal for more stringent regulations and quality control on plant-based nutritional supplements.

The researchers do mention, however, that in the animal studies, high concentrations of pure alkenylbenzenes were administered. In the supplements these substances are combined with many other components, which may reduce the risks, says Suzanne van den Berg, one of the researchers. 'We have recent research results which show that the negative effect is lowered by the interaction with other botanical components.' A follow-up study should cast more light on this question.' *Info: jac.niessen@wur.nl*

PLANT DISEASES

Biological control of groundnut disease

Bacteria can combat stem rot in the groundnut, concluded Cuong Le from the research for which he received his PhD in December at Wageningen University. Stem rot is caused by a soil-borne fungus which can become resistant to chemical fungicides. Soil bacteria from the Bacillus and Chryseobacterium families appear to be able to inhibit stem rot. Le also identified soil bacteria that stimulate the plant's growth. Between them, these bacteria hold out hope for the future of biological pest control for the groundnut plant.
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PHOTO IQIMAGES

ORGANIC PESTICIDES

Cabbage reacts to caterpillar spit

PHOTO TIBOR BUKOVINSZKY

Biological control of cabbage white butterflies also protects cabbage plants against the cabbage moth. This conclusion drawn by researchers at Wageningen University and their French colleagues was outlined in the PNAS journal in November. The caterpillars of the cabbage white are controlled using ichneumon wasps. The wasps lay their eggs in the caterpillars, after which the wasp larvae feast on their hosts. It now turns out that the growth of the larvae causes changes to the saliva of the caterpillar. This new type of saliva provokes a reaction in the cabbage plant, which makes it a less attractive place for the cabbage moth to lay its eggs. The effect depends on the species of ichneumon wasp that has preyed on the caterpillars. This knowledge could help towards the development of environmentally friendly methods of protecting cabbage plants against cabbage moths.
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LIVESTOCK

Distracting games for bored pigs

Wageningen UR Livestock Research ran a competition in November for new ideas for toys for pigs. Bored pigs start biting each other. The gadgets had to be affordable, practical, harmless and eco-friendly. The prize eventually went to a wooden pole for the pigs to chew on, combined with a metal basket of hay for slightly older pigs.
There were 20 entries in the competition. A jury of people involved in the research and in the pig industry assessed the entries. Meanwhile, researcher Mark Bracke is looking at other solutions. He is working with Utrecht School of the Arts, for example, on a computer game for pigs and people, Pig Chase. In the game a person can steer a moving light effect on a shed wall, using an iPad. A pig enjoys tracking the light with its snout.
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PLANT PHYSIOLOGY

Striga weed can be defeated

African farmers can combat the highly destructive *striga* weed with small doses of pesticide and with fertilizer. This finding came out of research done by Muhammed Jamil, who received his PhD at Wageningen University on 11 January. The weed will germinate where the roots of a crop contain certain plant hormones known as strigolactones. The pesticides inhibit the manufacture of these substances, and the phosphate in the fertilizer influences it too. Jamil also identified two promising rice varieties which produce only small quantities of strigolactones.
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ENVIRONMENTAL SCIENCES

PHOTO HOLLANDSE HOOGTE

Green city is cooler

Temperatures in a city are a few degrees warmer than those in the countryside. This leads to heat stress in the summer. More urban vegetation can cool down our cities.

Cities are islands of heat in the cooler countryside. Meteorologists call this temperature disparity the heat island effect. Researchers at Wageningen University and Alterra, both part of Wageningen UR, calculated this effect for more than 20 Dutch cities, using data provided by good amateur meteorologists. They had little choice, since there are few official weather stations in cities and the Royal Netherlands Meteorological Institute (KNMI) does not take readings in the cities.
The researchers calculated a maximum daily heat effect for the cities. This is the difference between the temperature in the city and that at the nearest KNMI weather station. Wageningen's heat effect over a year was 2.4 degrees Celsius, average for the Netherlands. In Rotterdam, it was 2.8 degrees warmer on average than it was outside the city, while in Groningen the difference was only 1.5 degrees, thanks to cooling sea breezes.
The island effect can mean unpleasant degrees of heat in the summer for city residents. This heat stress, as it is called, can range from difficulty sleeping on warm nights to heat stroke. Heat stress is not usually much of an issue in the Netherlands.
Nevertheless, heat stress does affect one third of the country's cities on seven days per year, and twice as often in a city such as Rotterdam. Highly built-up cities with many tall buildings retain more heat, so it cannot escape so easily. More vegetation can cool things down. 'With each percent more vegetation, the heat effect goes down by 0,06 degrees', says Gert-Jan Steeneveld.
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POULTRY FARMING

New barns for sustainable chickens

Chicken can be produced more sustainably. This is demonstrated by two new designs for sheds for meat chickens developed by researchers at Wageningen UR Livestock Research together with stakeholders in the sector.

The new systems are better for the chickens, for people and for the environment, and they make antibiotics almost redundant. One of the reasons for this is that the chicks hatch on the farm and spend their first few weeks in a sheltered environment. They also get twice as much space as they have in conventional systems, their litter is changed regularly and automatically, and the ventilation in the shed is almost entirely natural. Stressful methods of catching the chickens are rendered unnecessary: they leave the shed on conveyor belts.

Two completely different designs were created with these specifications: *Windstreek* and *Som der delen*. The *Windstreek* shed is a low building that makes good use of the prevailing wind for natural ventilation. Young chicks start out at the low end of the shed, and can move later to the high and open end, which has a covered outdoor area. Thanks to the variation in climate and surroundings, each chick can choose to go where it feels most at ease.

The *Som der Delen* design resembles the earlier round design of the *Rondeel* shed for laying hens. A *Som der Delen* shed is organized from the centre outwards. Chicks of various ages are found in different areas of the shed, making for an efficient use of space. Excess heat generated by older chicks is used to keep the newborns warm.

The production costs of sustainable chicken are a little higher, but that can be made up for by making more efficient use of the meat. The new systems still need to be tested on the ground. Several companies are working with Livestock Research on a feasibility study for the *Windstreek*.

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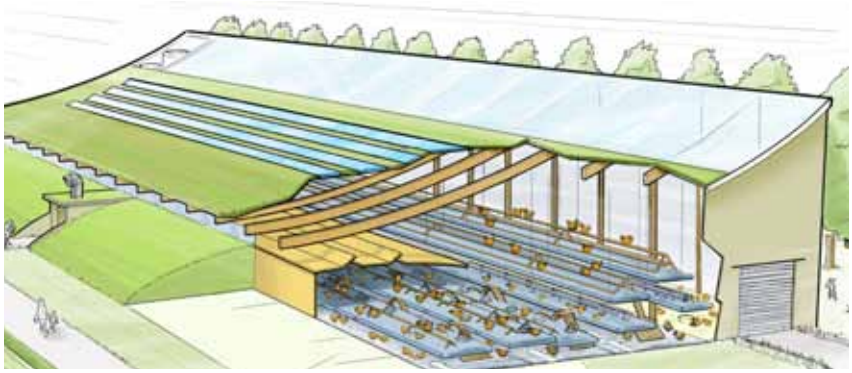

Design of the Windstreek shed.

NATURE MANAGEMENT

Effect of light on nature

Roy van Grunsven of the Nature Management and Plant Ecology chair group at Wageningen University is working on the Netherlands' biggest ever light pollution study (*www.lichtopnatuur.org*). The research is funded by technology foundation STW and implemented by several organizations, including the Netherlands Institute for Ecology (NIOO-KNAW), Philips, the Dutch natural gas company NAM, and various organizations that manage estates and nature areas. Back in 2005, the NAM introduced green lamps developed by Philips on its drilling platforms, to reduce the disruption of bird migrations.

Over three years, the researchers are going to study the effects of green, red and white light on birds, insects and small mammals. To this end lampposts have been installed at eight locations in nature areas on the Veluwe and in Drenthe, both rural areas of the Netherlands. And in butterfly cages outside Wageningen, the influence of light on grasses, herbs and moths will be studied. *Info: roy.vangrunsven@wur.nl*

ENVIRONMENTAL SYSTEMS

Birds and butterflies lag behind climate

Birds and butterflies cannot keep up with the pace of climate change. Over the last 20 years, butterflies have lagged 135 kilometres behind shifting climate zones, and birds at least 200 kilometres. This claim was made by a group of European researchers including one researcher at Wageningen University in an article in the January edition of *Nature Climate Change*. The researchers developed a method of pinpointing the consequences of climate changes for groups of species. For example a fragmented landscape can make it difficult for species to reach new habitats. The long-term consequences of this failure to keep up with the changing climate are still difficult to predict.

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FOOD WASTE IS BEING TACKLED

Past its sell-by

The Dutch throw out 4.4 billion euros' worth of food every year. The government wants to cut this figure by 20 percent by 2015. Should be possible, say Wageningen experts. There is a lot to be gained through some quite simple measures.

TEXT ASTRID SMIT **PHOTOGRAPHY** HOLLANDSE HOOGTE **ILLUSTRATION** JENNY VAN DRIEL

Eating food that is past its sell-by date doesn't sound an especially appealing hobby. And yet the 'Past its sell-by Dining Club' in Amsterdam has served up some delicious meals over the past six month, says initiator Willem Velthoven of cultural organization Mediamatic. ´Loads of food items that are past their date are still perfectly edible. We throw them out quite unnecessarily.´

Last summer, Velthoven and his colleagues set out to demonstrate this to the general public. They collected ingredients that were about to be binned from shops in the neighbourhood and invited a chef to concoct a free meal with them, together with anyone interested. 'You might not expect this, but the shopkeepers were happy to help us. They liked the idea that we were doing something with food that it often hurts them to have to throw out', explains Velthoven.

The 'Past its sell-by Diners' Club' was a success. Instead of one or two meals over the summer, there were 20 well-attended dinners running right up until winter set in. 'It was a real eye-opener for the guests, who were welcome to bring in products from home that were past their sell-by date. Many of them had no idea you could bake pancakes with sour milk, or that flour that is past its sell-by date is perfectly usable as long as you can't see any wildlife crawling around in it. One man brought in some chilli sauce made in 1981; it was still delicious.'

Needless food waste is bothering growing numbers of people. In Belgium, 'dumpster diver' Steven de Geyns received mass support from demonstrators in January, according to a report in Dutch newspaper de *Volkskrant*. He had been sentenced to six months in jail for fishing two bags of muffins out of a garbage container outside a supermarket. Theft, said the judge. But according to De Geyn's supporters, throwing out muffins is a waste of food. 'Where is your conscience?' they chanted in court.

AN ACCURATE PICTURE

Astonishing amounts of food go uneaten every year. In the Netherlands alone, about 4.4 billion euros' worth, according to expert estimates. Farmers, trade organizations, food producers, supermarkets and caterers waste about 2 billion euros' worth between them, and consumers account for the other 2.4 billion. 'But these are very rough estimates', says Toine Timmermans, programme manager at Wageningen UR Food & Biobased Research. This institute is involved in several Wageningen research projects that are tackling food waste. 'In the coming years we want to get a more accurate picture of what and how much gets thrown out in each sector. But one thing is certain: an awful lot of food is wasted.'

It is not wasted wilfully, however. Supermarkets want to guarantee quality and do not take any risks in this respect. They remove products that are approaching their sell-by dates from the shelves, even if they are still perfectly edible (see text box). The same goes for fruit and veg. Wilting lettuce or bruised apples are not offered for sale. 'The average supermarket throws food worth between 500 and 1,000 euros away every week, which is 1 >


Goede morgen!
chocolade vla
VAST
ardappelen

to 2 percent of their turnover', says Timmermans.
It is the same story in health care institutions and in the catering branch. In fact, they often discard at least 5 and up to 60 percent of the food they buy. It is often hard to estimate what the demand will be for their meals, and they have to meet very strict regulations. Since 2007, they are not allowed to display their products for more than two hours. 'Since then, levels of food waste have shot up', says Timmermans.
A lot of food gets wasted before it even reaches the supermarket, too. In fact, this accounts for between 5 and 10 percent of the total volume, says Timmermans. Take curved cucumbers or forked carrots, for example: most of them never reach the supermarket or greengrocer's shelves. And any food that does not meet norms for pesticide residues or for quality, thanks to a faulty machine in the factory, gets pulped.

'One thing is certain: an awful lot of food is wasted'

But consumers waste the most food. About 10 percent of the food they buy goes uneaten. This amounts to about 40 kilos or 145 euros per person per year. There are several reasons for this, according to numerous studies by Dutch organizations including the ministry of Economic Affairs, Agriculture & Innovation (EL&I), the Nutrition Centre and environmental organization *Milieu Centraal*. Consumers do not plan properly, buy and cook too much, or needlessly throw out foods which are past their sell-by date. Packaging sizes are also often too large for

FOOD WASTE IN EUROPE

Total amount of food produced for human consumption per year

654 million tons

Total amount of food wasted per year

205 million tons

Waste by consumer: **34%**

Waste during production, harvesting, processing and trade: **66%**

small households and the habit of using up yesterday's leftovers has largely died out. Young people tend to waste more than older people, and the employed more than the unemployed or retired. The most striking research finding, however, is that people are almost universally convinced that they do not waste very much food. Their garbage bins tell a different story.

The big question is, though: how do we prevent this – rarely deliberate and largely unconscious – waste of good food? The ministry of EL&I aims to get us to reduce food waste by about 20 percent of 2009 levels by 2015. Europe, it was announced early in January, aims at a 50 percent cut by 2025. Are these feasible objectives? Timmermans, at Food & Biobased Research, thinks they are. By adjusting the regulations and expanding people's knowledge about the food they buy, you could reduce food waste considerably, concluded Timmermans together with other staff of Food & Biobased Research and the agricultural economics institute LEI, also part of Wageningen UR. In their report *Reducing Food Waste*, which came out in November, they talk of the lack of clarity about what is allowed after the use-by date has expired. This causes companies to take products off the shelves unnecessarily.

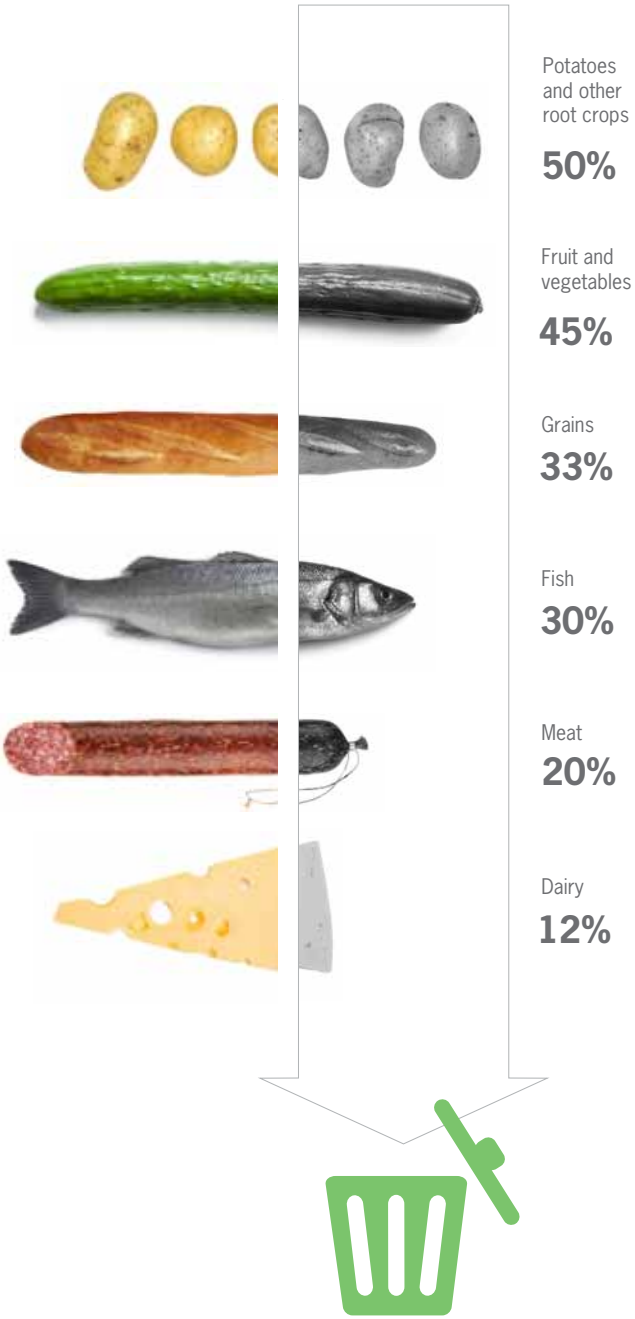
Regulations on displaying freshly made foods also need adjusting, say the authors of the report. The rule that forbids catering outlets to display their wares for more than two hours leads to waste. Some companies are granted an exemption because they can guarantee that their products are still of good quality after two hours. This factor in primarily at work in the catering branch, explains Timmermans. 'Big companies such as Sodexo and Compass are allowed to ask for exemptions for specific products. For this they need to provide evidence from research, which can be pretty expensive, not least because the recipe for particular products can vary.' So the report suggests that the government should investigate whether more companies could obtain exemptions.

TAKING UP THE CUDGELS

The catering sector has also taken up the cudgels against food waste itself recently, through the branch association Veneca. Veneca asked Food & Biobased Research to analyse current levels of food waste and identify the underlying causes. The first provisional findings are that dairy products, soup, bread and pre-cut salads are the main items that land in the bin. Secondly, the sector could reduce this waste significantly by making simple changes. 'For example, by not making a fresh pan of soup a quarter of an hour before closing time. That may be providing good service for the last customer, but it is a waste of >

WASTE OF PERISHABLE PRODUCTS

Total waste per food category, in percentage of amount produced (Europe)



soup', says Timmermans. In the course of the coming year, Food + Biobased Research will be exploring other easy ways of cutting down waste in the catering branch. Health care institutions are equally keen to find ways of preventing the food they buy from ending up in the bin. The Maxima Medical Centre (MMC) in Brabant launched a pilot scheme called Meals on Wheels: the hospital took on a caterer that brought meals to each patient personally. Their nutrition assistants serve two full meals, and patients can say exactly what they want on their plates, and how much.

This makes a big difference to the amount thrown out. The MMC used to throw out 40 to 50 percent of the food served; with Meals on Wheels this has been cut to just 2 percent, says Joost Snels of Food & Biobased Research, who is analysing the project's impact for the hospital. This saves the MMC 400,000 euros per year. 'Patients no longer have to decide what they want to eat days or hours in advance, as is so often the case. What tends to happen then is that by the time the food comes, they don't fancy what they ordered and leave half of it on their plates', says Snels. The success of this concept has not gone unnoticed. Last year, Meals on Wheels won the No Waste Award, a prize awarded by the ministry of EL&I for an innovative project to combat food waste.

'Someone brought some chilli sauce made in 1981; it was still delicious'

INVESTING

In the near future we can expect to see many more innovations that can help reduce food waste. Last year the Top Institute Food & Nutrition decided to invest six million euros in projects which will analyse the entire chain from the primary producers to the consumers and look for ways of making improvements, both by reducing waste and by adding value. In this regard, researchers look into the scope for the industry to convert raw materials into food more efficiently and to make good use of by-products. The branch organizations of the supermarkets (the CBL) and of the food industry (the FNLI) are funding this research jointly with the government, Wageningen UR, NIZO food research and research organization TNO.

'To start off with, we are targeting meat, bread, vegetables and fruit. The products with which the biggest losses are made', says Timmermans, who coordinates this project. The top institute is putting PhD and post-doc researcher to work at all levels. From mathematicians who develop software to improve the matching of supply and demand between supermarkets and suppliers, to biochemists who use micro-organisms to find out whether they can determine the shelf life of fruit and vegetable at an early stage.

Elsewhere in Wageningen UR, work is going on to develop microchips that will be able to tell the consumer much more precisely how long a fresh product will stay fresh. Working together with Eindhoven Technical University, Philips and the Holst Centre, Wageningen is testing whether certain volatile substances released in the ripening process in fruit and vegetables or in the rotting process in fish or meat can be detected by a sensor in the packaging. Tiny van Boekel, professor of Product Design and Quality Management at Wageningen University, part of Wageningen UR, is involved in this project. 'So you would be able to see on this sensor whether the product is still fresh, and how long it will stay that way. Producers play it safe at the moment, to avoid being sued. They won't need to do that once they have these microchips.'

But this modern version of the sell-by date – which tells you far more about the condition of the product because it measures its actual quality rather than predicting it at the factory – is not yet ready to be rolled out in the supermarket. 'We first need to find out which volatile substances are suitable for this purpose, and what they tell us about the quality and shelf life of the product. I think that will take us another few years', says Van Boekel.

Given the number of initiatives, it should be possible to reduce food waste – from the farmer to the consumer – by 20 to 25 percent in the next few years, thinks Timmermans. The toughest task is to reduce consumer waste, which at 2.4 billion euros per year accounts for more than half the total amount. 'It is quite difficult to influence consumer behaviour. You see that with health campaigns, which often just don't make an impact.'

But there are some positive examples out there. Ten years ago, Great Britain launched a major national anti-waste campaign for which an organization called WRAP was set up. Together with about 400 organizations, including su-

BEST BEFORE?

Many people think they should discard any products past their 'sell by' date because they are bound to have gone mouldy or be harbouring nasty bacteria. But this is a misunderstanding. Very many products can safely be consumed after the date on the packaging. In some cases, they can be eaten months or even years after the date. The important thing is to understand the difference between a use-by date and a sell-by or best-before date. It is often advisable to take a use-by date seriously, as this date is used on perishable products such as meat, fish and dairy produce. A 'best before' date is given on less perishable goods and says more about quality, and less about possible health dangers. The manufacturer guarantees the taste and quality up until the date mentioned, but it is not a problem for the consumer to eat it after that date. According to the Netherlands Food and Consumer Product Safety Authority, salt, sugar, dried pasta, coffee, tea, rice, syrups, sweets and conserves in tins or jars (fruit, vegetables, soups, meat, fish, evaporated milk and jams) are safe to use for one year after their expiry date. Products such as flour, muesli, cornflakes, spreads such as peanut butter or chocolate sprinkles, oil, mayonnaise and ketchup are safe for at least two months beyond the date.

permarkets and food producers, WRAP put out the message that it is a shame to throw out food. With success, a recent evaluation shows. After five years of campaigns under the slogan, 'Love food, hate waste', British consumers are now chucking out 13 percent less food. One striking finding is that they are still spending the same amount of money on food. 'The British are probably now spending money on better quality products', suggests Timmermans.

But WRAP cost a lot of money too. The British government invested millions in this campaign. The Dutch government is not prepared to go that far. For the time being, the Dutch Nutrition Centre and *Milieu Centraal* have to be satisfied with trying to raise consumer awareness with relatively small-scale campaigns such as one currently running, called 'Food is for eating' (*www.etenisomopteeten.nl*). The 'past its sell-by diners club' (*www.overdatum.org*) in Amsterdam has stopped for now. 'We might start up again on another footing in a couple of months' time, but we don't know yet', says Veldhoven of *Mediamatic*. 'But we do urge others to follow suit and start their own 'past its sell-by clubs'. Really, once you take the plunge and go and talk to a shopkeeper, it is remarkably simple. You are usually welcomed with open arms.' ■

Rubber from dandelions and shrubs

Guayule

Russian dandelion

Wageningen researchers are getting the Russian dandelion and an American shrub ready to take over the role of the rubber tree. 'The financial picture looks good.' TEXT NIENKE BEINTEMA

Endless rows of dandelions or guayule, an American shrub, stretching out to the horizon: this could be a reality in Europe in ten years' time. Biofuel? No - rubber. The cells of the Guayule bush contain rubber particles while the sap of the Russian dandelion plant (a cousin of the dandelion that is a familiar sight in the Netherlands) contains high-quality latex, the raw material for rubber. And thanks to guayule and the Russian dandelion, Europe will be able to make its own rubber gloves and car tyres in the not too distant future. That is the idea behind a European research project, EU-PEARLS, in which Wageningen UR is playing a key role. The consortium includes KeyGene and car tyre manufacturer Apollo Vredestein, along with research groups from various countries.

'Rubber traditionally comes from the rubber tree', explains Robert van Loo of Plant Research International, part of Wageningen UR (PRI). He is one of the researchers. 'Originally, rubber trees come from South America, but large-scale production has never been possible there because of a fungal disease. That is why large rubber plantations are only to be found in Southeast Asia. But disease could break out there too. It's a very vulnerable crop.'

ALTERNATIVE SOURCE

Rubber is an important raw material, explains Van Loo, not just for industry but also for healthcare, the transport sector and even for defence. That is why the Americans were already looking for an alternative source back during the Second World War, when trade with Southeast Asia had ceased. And they found it. Guayule, a shrub from the same family as the dandelion, has rubber particles in its cells, which on extraction form latex with its characteristic milky colour. This shrub grows in the desert in Mexico and the southern USA. 'They never went on to cultivate it on a large scale there', says Van Loo. 'But there is now renewed interest in alternative rubber. Rubber prices have risen more than fivefold over the last ten years.' He explains that this is largely due to the rapid increase in demand from countries such as India and China. There is a threat of global shortages, especially in view of the vulnerability of the plantations. 'All the more reason for Europe to secure its rubber supplies.' This could be done in Northern Europe by growing the Russian dandelion, while further south guayule has stronger potential.

The aim of the EU project is to set up and optimize the entire production chain in Europe, from plant to final product, using not just the Russian dandelion but also the guayule as a source of latex. Wageningen researchers have taken on a number of chal-

‘Rubber prices have gone up more than fivefold in the past ten years’

lenges. For example, they are trying to improve the genetic makeup of the two plant species in order to increase their production and their resistance to disease. ‘We are using marker-assisted breeding to achieve this’, says Hans Mooibroek of Wageningen UR Food & Biobased Research, the EU-PEARLS coordinator. ‘This is a method for crossing certain genes in plants in a very targeted way.’

PRI is also carrying out ‘classic’ agronomic research into the guayule, with field trials in Spain to investigate the influence of soil, climate, water and fertilizers on the plants’ growth. Mooibroek emphasizes that the businesses in the consortium also have a crucial role. For example, KeyGene has undertaken to do some of the breeding research and Vredestein is working on testing the rubber in car tyres.

MOLECULES IN LONG CHAINS

The molecule that serves as the foundation for the production of rubber is isoprene, a relatively simple organic molecule. In latex and rubber these molecules are linked together in long chains, or polymers – something plants are much better at doing than chemists. ‘There are other plants that make polyisoprenes,’ says Van Loo, ‘such as our own dandelion. But its chains are not nearly as long and so it can’t be used as the basis for rubber.’

The project’s initial results are extremely positive, according to Mooibroek. ‘We can expect to achieve annual yields of 1,000 to 1,500 kilos of rubber per hectare. We can get that from guayule now and from the Russian dandelion in a few years’ time’, he says. ‘That would mean these two crops can compete with rubber trees.’ In fact, these crops can be grown more efficiently because you can harvest the plants mechanically. Investigations are still going on to discover the best method for extracting the latex from the plants.

The process does not just produce rubber, emphasizes the project coordinator. For example, a by-product of the cultivation of the Russian dandelion is inulin, a compound that can be used as the basis for all kinds of chemicals. Mooibroek: ‘The financial picture looks promising.’ Now it is just a question of time, think the two Wageningen scientists. The first natural rubber from Europe should be on the market in about ten years. ■

PHOTO ANP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On deaf ears

'Arguments are of limited value. You cannot change people's thinking with communication', says departing professor Cees van Woerkum. No wonder things went wrong in the debates about biotechnology and the plans for underground CO_2 storage in the Dutch town of Barendrecht.

TEXT RENÉ DIDDE **ILLUSTRATION** YVONNE KROESE

A few years ago, Shell and the Dutch government hatched a plan to store CO_2 in an empty gas field under a housing estate in Barendrecht, a Dutch town near Rotterdam. One evening, a Shell technician came to the town to give a glowing account of the science behind the storage plans. 'She did it very well', recalls Cees van Woerkum. 'She explained the technique in simple language and she emphasized that the chances of an accident are negligible.' But things still went wrong that evening, because technical issues were not the only thing on local residents' minds. There were other dissatisfactions in the air, causing a growing distrust of the CO_2 storage plans. By the time a group of officials including two ministers visited the rebellious town, protest had swelled to such massive proportions that further discussion was useless.
A wonderful case study, says Van Woerkum, who retired in November and is now emeritus professor. 'The Barendrecht residents were stoking each other's fears of an accident, of their houses losing value, and of the idea that Shell was treating the area as a rubbish dump for its waste products', says Van Woerkum. 'They looked for and found – from experts as well – arguments to support their ideas, their 'frame', in communication jargon.'

CLASSIC MISTAKE

Shell was convinced of its own frame and imagined it could convince the opponents of the CO_2 storage with sound arguments. A classic mistake, says the professor. 'Communication is not an instrument with which you can change other people's minds. People hold other opinions for a reason. It is not enough to put across clever arguments based on your own frame. You need to come to grips with your opponents' frame.'
It is the same with the decades-long debate about biotechnology and food, argues Van Woerkum: 'Scientists and company representatives who trade in genetically modified crops, such as the recently developed BASF potato from which good quality industrial starch can be made, emphasize the environmental and cost advantages.' But that is not a frame that people who see biotechnology as an 'unnatural' gastronomic nightmare can relate too. Nor will religious people who consider biotechnology as 'interfering in God's creation' be influenced by such arguments.
Van Woerkum also feels that the extreme positions taken by groups such as Greenpeace come in for too much attention from scientists and the business world. 'This leads to more moderate groups such as the consumer association being left out of the discussion.' He also feels that biotechnology companies fail to make use of websearches: finding out what people are saying about the company online. 'Once you know that, you can launch a webcare to get in touch with these people on the internet and try to influence them. I think there are a lot of unexploited opportunities in that area.'

INTEGRATION IN SOCIETY

Van Woerkum thinks scientists are too eager to prove that something like biotechnology is of interest to society in terms of environmental advantages or improved food security. 'What they should say instead, when they formulate their research questions as well, is: we are researching which uses of biotechnology could be of use to society. Scientists should focus less on the technology itself and more on its integration into society.' >

The debate in biotechnology has now reached an impasse. So it is time for scientists and companies to get to grips with the public's frame, says Van Woerkum. 'They should make contact with people, get an understanding of their fears and their prejudices, and take these seriously as the basis of their beliefs. You should never go into an extension meeting with just a technical PowerPoint presentation.'

So what should Shell and the Dutch government have done in Barendrecht? 'They should have walked around the neighbourhood more; they should have found out in advance what the mood was there. In other words, they should have tuned in to the community. Ask people questions: 'what are you afraid of?'; 'why do you think the whole thing will subside?' And they should never have gone ahead without the government. They should have acted together.'

There were a few slip-ups on the part of both local and national government too, says Van Woerkum. 'If a civil servant or a minister had made the importance of CO_2 storage clear on that first evening, it might have been possible to influence the frame of worried residents. They should have explained that it was a transitional measure to win time before making the switch from fossil fuels to sustainable energy and address the climate problem.' But the government left it all up to Shell, and Shell only sought dialogue on technical points. The result was a 'frozen frame', a war of words, an impasse. It is not yet widely understood, says Van Woerkum, that communication is not an instrument with which you can just go in and sort out an issue, but is more of a two-way system with one set of beliefs or frame on the side of the transmitter and a separate frame on the side of the receiver.

Bert Lotz
researcher at Plant Research International

'The role of contact person for the wider community is very important, and nice'

NEIGHBOURHOOD WALKABOUT

A bit of a simplification, says Wim van de Wiel, the Shell press officer who was involved in the Barendrecht case. 'More than a year before the information evening, we went on a walkabout in the neighbourhood in relation to the environmental impact report. We talked to an enthusiastic town councillor and to civil society representatives', Van de Wiel recalls. 'We explained the idea behind the CO_2 storage and literally asked them, 'What are your concerns?'

On the basis of that research, Shell concluded that Barendrecht must be a 'viable plan'. 'We did not have the impression that people were against it, and the government, which at that time placed a high priority on CO_2 storage, promised to attend the meeting. But then the ministry of Economic Affairs cancelled shortly before the meeting, and we had to go into it on our own.' The enthusiastic councillor also made an abrupt U-turn.

Van de Wiel, who still feels somewhat frustrated about the affair, thinks that at worst, Shell may have been in too much of a hurry. 'It also turned out later that, besides concerns about CO_2 leaks and a drop in the value of houses, there was a feeling among the locals that Barendrecht had put up with enough from the government over the past 15 years, what with the laying down of the Betuwe and the high-speed railway lines, and

Wim van de Wiel
press officer for Shell

'There was a feeling that Barendrecht had put up with enough from the government'

FOTO LINELLE DEUNK

CEES VAN WOERKUM

After forty years at Wageningen University, part of Wageningen UR, Cees van Woerkum (b. Eersel, 1947) has said his goodbyes. He joined the then agricultural college as lecturer in extension studies straight after graduating in sociology at Nijmegen University in 1971. He went on to obtain a doctorate in 1982 for a study on planning in communication programmes. His appointment as professor of Communication and Innovation Studies followed in 1989. Eight years ago, Van Woerkum shifted the focus of his work from the extension message itself and how it reaches the target group to those on the receiving end of extension efforts. Understanding how they think is crucial to the communication process, Van Woerkum believes. And so in 2003 he delivered a second inaugural lecture, this time for a chair in Communication Strategies.

the widening of the A15 and the A29 highways. We may have underestimated that.'

POOR COLORADO BEETLES

At Wageningen UR's Plant Sciences group, Erik Toussant is a seasoned veteran when it comes to communication on the controversial subject of genetic modification. 'There are many different frames. It makes a lot of difference whether you are at a meeting with a group of rural women or at a press conference for science journalists. In fact, exactly the same sentence uttered by the same speaker can be interpreted in completely different ways by different people.'

According to Toussant, the different starting points of different audiences have been taken into account in scientific communication since the mid-1990s. For him the big eye-opener came during a meeting at which a genetically modified potato was discussed which manufactures a toxin that kills off the destructive Colorado beetle. Toussant: 'Someone in the audience called out: 'Yes, but then all those Colorado beetles will die'. They would otherwise have been wiped out by pesticide spraying, but this told us something about a frame which I hadn't really considered.'

This is reminiscent of a famous example of British scientists who published an article on a potato that was resistant to aphids that carry harmful viruses. During field trials they also noticed that there were fewer aphid predators such as ladybirds. 'The disappearance of the ladybirds caused a big outcry', says Toussant.

RADICAL CAMPAIGNERS

Some scientists have more sense of what is newsworthy and are more media-savvy and in touch with the general public than others, says Toussant. 'You can coach them and train them but it remains a talent that you've either got or you haven't. And make no mistake about it: even though it is time-consuming, our staff do take every media opportunity they get.'

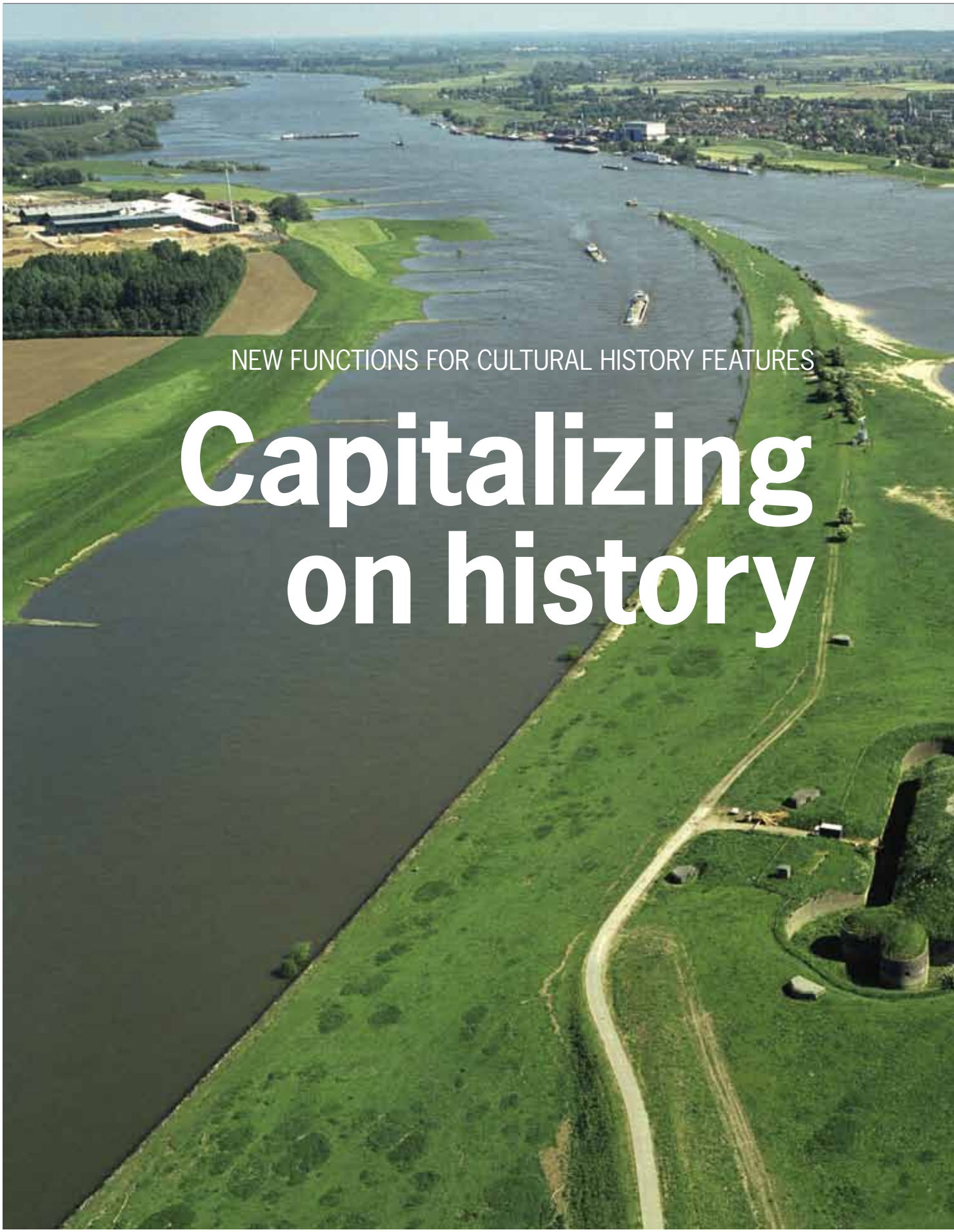
Among the staff is Bert Lots of Plant Research International, part of Wageningen UR. Lotz is the type who will have a few beers down the pub with Greenpeace campaigners, so as to get a better understanding of their point of view. Or he'll drop in at a protest camp and enter into a debate with radical campaigners from A-seed, whose activities have included bringing out a film called 'Gene seeks farmer'.

'My first aim is to do independent research, to be transparent, and to publish in scientific journals', says Lotz. 'Debating, defending your scientific position, and being a contact point for the community are important too though. And nice. I give least emphasis in this to the radical groups with extreme standpoints. I focus more on church organizations, rural women the consumer association and the Rotary Club.'

Wageningen UR is organizing an open day of its own at which the general public are invited to have a look at trial plots with modified potatoes or resistant maize. 'In doing this I am aware of the different frames at work. By keeping up the dialogue, we can escape from the frozen frames. A good example of that is the way the Christian Union political party has started to view cisgenesis. The party now accepts this form of genetic modification, done with genes of the same kind. You can introduce resistance genes into potatoes or apples, for example, much faster with cisgenesis than with classic breeding techniques. The Christian Union therefore feels that cisgenesis can contribute to making agriculture more sustainable' ■

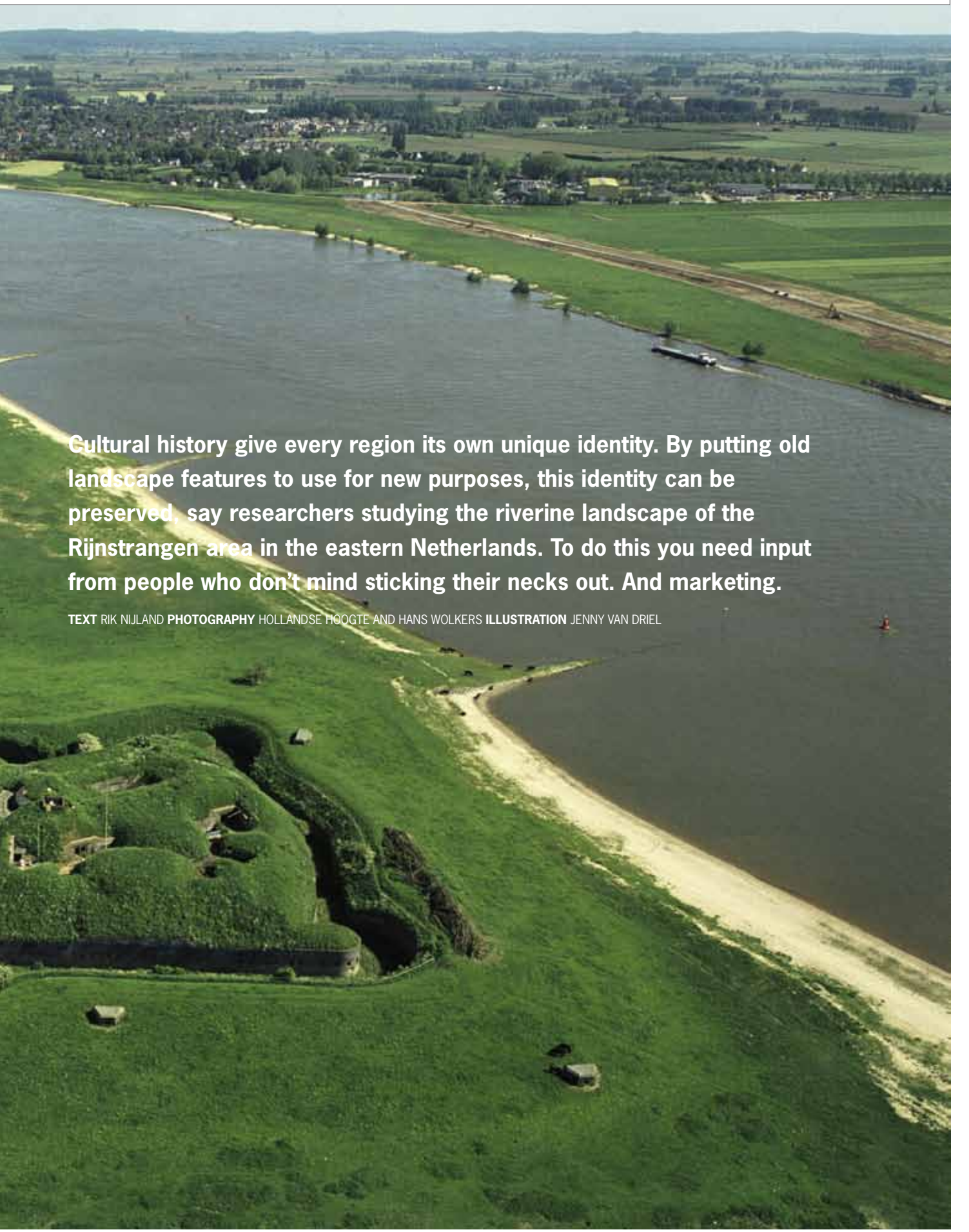
Erik Toussaint
spokesperson for the Plant Sciences Group

'Someone in the audience shouted out: yes, but then all those Colorado beetles will die'



NEW FUNCTIONS FOR CULTURAL HISTORY FEATURES

Capitalizing on history



Cultural history give every region its own unique identity. By putting old landscape features to use for new purposes, this identity can be preserved, say researchers studying the riverine landscape of the Rijnstrangen area in the eastern Netherlands. To do this you need input from people who don't mind sticking their necks out. And marketing.

TEXT RIK NIJLAND **PHOTOGRAPHY** HOLLANDSE HOOGTE AND HANS WOLKERS **ILLUSTRATION** JENNY VAN DRIEL

As soon as John Mulder (64), cultural heritage researcher at Alterra, part of Wageningen UR, drives into the *Rijnstrangen* area between the Rhine and the Waal rivers in the eastern Netherlands, he doesn't stop talking. He notices flood gullies, earthworks and dike houses, ridges, overflow channels, and cross-dikes built by villagers at the end of the middle ages to hold back the water if the river dike broke in the neighbouring village. Between them, river and humans have formed a varied landscape here. Not that this is obvious to the untrained eye looking at this cultural landscape north of the Waal river, between the settlements of Lobith, Oud Zevenaar and Doornenburg castle, just across the Pannerden canal. But with Mulder's running commentary providing one enthusiastic story after another, you won't miss it.

It was 30 years ago that Mulder first visited this district with a colleague from the former Stiboka (a foundation for soil mapping), in search of traces of Roman settlements. The passion that was borne then now shines out of the report *Key to the past, key to the future*, compiled by Mulder together with Ferdinand van Hemmen of the Bureau for Landscape History in Huissen and Marije Tilstra of consultancy firm Royal HasKoning. At the request of the province of Gelderland, the three municipalities in the area and the Rhine and Ijssel water board explored the question: what is the cultural-historic value of the area and how can this be exploited?

'Cultural history gives the area its identity and it's a calling card, but it can also play a role in inspiring new developments', says Mulder at De Panoven, a property just south of Zevenaar. 'The owner has restored this old brick and roof tile factory from 1850, which is next door to his hotel, and turned it into an information centre about the brick industry. And he rents out the drying shed as group accommodation. So a piece of cultural heritage that was going to pot has been given a new lease of life by this private initiative', says Mulder. 'Did you know that the Rijnstrangen area was the cradle of the Dutch brick industry?'

TOURISM POTENTIAL

The district has great potential for tourism, for example for walkers or cyclists, say the writers of the report. All the more so if the region does more to cherish and emphasize its cultural history. This means putting disused old features to use for new purposes. These would vary from reintroducing the steam engine in an abandoned pump house to creating a hiking route taking in the earthworks and fortifications erected as defences during the Dutch war of independence in the 16th and 17th centuries. 'You can bring the cultural history to life even more there by offering supplementary information via smartphones', suggests Mulder. Such information has a nationwide appeal, in his view. 'The *Rijnstrangen* are riddled with the traces of events that had a far-reaching impact on our national history as well as the history of our waterways.'

This was where, in the 1630s, Johan Maurits and Fredrik Hendrik successively besieged the Schenkenschans fortress, which had fallen into Spanish hands. It was also where, in the 'disaster year' of 1672, French King Louis XIV's troops crossed the silted up Rhine almost unopposed. This was then such a weak point in the national defences that the decision was taken in The Hague to dig the Pannerden canal, in-

The rope ferry provides a taste of **traditional means of transport.**

Old farm polders form the basis for **new nature areas.**

‘Cultural history is a source of inspiration for new developments’

BELVEDERE

In the *Belvedere memorandum* of 1999, the Dutch government acknowledged the value of cultural heritage in the Dutch landscape for the first time. Many provinces picked up on the theme. For example, the province of Gelderland issued the *Belvoir* policy paper a year later, expressing the aim of conducting a heritage policy in which spatial, economic and cultural interests would reinforce and inspire each other. The research on the *Rijnstrangen* was carried out with a Belvoir grant. Meanwhile, the *Belvedere* memo has been followed up with *Opting for character, visual heritage and space*, in which the cabinet outlines its strategy for the period up until 2015. The main implementing body for this policy is the Netherlands Cultural Heritage Agency, under the ministry of Education, Culture and Science.

itially as a defence line but later also to reroute the Rhine and as an essential part of the series of water-based defences called the New Dutch Water Line. And it was here, in the 17th century, that the Waal river changed its course in a northerly loop, threatening to merge with the Rhine. ‘If that had happened, Leiden and all the larger towns in the west of the country would have been in big trouble’, says Mulder.

FORT PANNERDEN

The prototype and showpiece for the water management and military importance of the district is the recently restored Fort Pannerden, which safeguarded the steady flow of water to the water line. According to the authors of this report, this location should grow into a major attraction. This is one of their 19 suggestions for how to highlight the area’s cultural history and stimulate the local economy. The suggestions range from new hiking routes to a large-scale plan for digging a new channel between the Upper Rhine and the course of the old Rhine – if that can be done safely. This would create scope not only for emergency water storage in times of flood, but also for constructing some top-end housing and restoring the lost harbour at Lobith for pleasure boats or perhaps as a boatyard for the restoration of old ships.

It is easier to capitalize on cultural history in the cities than in the countryside, says Eric Luiten, professor of Cultural History and Design at the Technical University of Delft. Luiten, a Wageningen alumnus, was one of the speakers at the congress on the ecological and economic value of cultural history hosted by Van Hall Larenstein University of Applied Sciences at the beginning on >

An old farmhouse lives on as a **country home.**

A former groundwater seepage pool now serves for **water storage.**

January. ‘Architectural heritage in the city is popular with companies or with people in the creative professions who are looking for a special place to live or work. That is more difficult in a rural area; you can’t put buildings to new uses if there is no interest in doing so.’
Luiten himself became well known through his involvement in the restoration of the New Dutch Water Line. Luiten: ‘To make a success of a project of this sort, it is important that people who don’t mind sticking their necks out feel part of a kind of movement, and feel they are working together on a local revival. It has to be a kind of childhood dream – a restaurateur who pursues his dream of setting up shop in a fort in spite his bookkeeper muttering, ‘Do you know what you are letting yourself in for?’ The second requisite is good marketing, Luiten is convinced. ‘For the Water Line there is an organization that promotes the forts and the events laid on in them.’
It has not yet reached this stage in the *Rijnstrangen*, though, as councillor Jos Lamers from the Rijnwaarden municipality makes clear. Collaboration between the surrounding municipalities is gradually increasing, but his efforts to map out a canoeing trail for nature-lovers, for example, have run up against a veto from the state forest service.

ENTREPRENEURS INTO ACTION

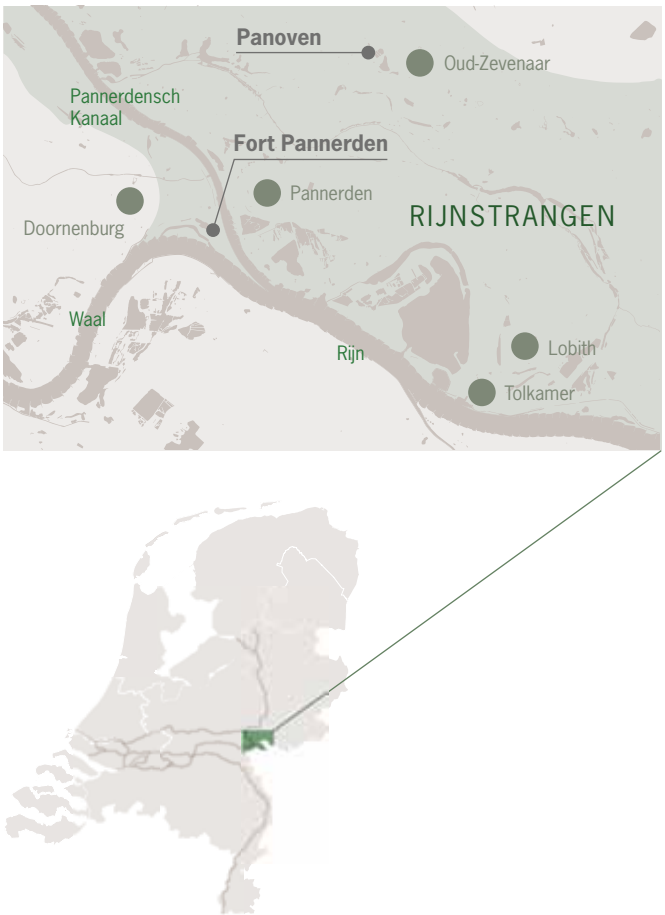
Lamers is very impressed by the report. ‘You often get all sorts of claims being made in a scientific study like this, but without much link with everyday practice. In this case, there are concrete recommendations in the report which we, or entrepreneurs, can take up’, says the councillor. The report also draws the attention of local residents to the value of the cultural history of the area. ‘By linking its conservation with economic developments, you create a sound basis. If you are dependent on grants or sponsors, conservation is a lot less secure in the long term´, says Lamers. He tries to get this message across to restaurateurs and other entrepreneurs in the area, to inspire them into action. For example, there is still a lack of accommodation in the area, although the number of bed & breakfasts is rising rapidly. ‘I could imagine that at some point we will apply for the status of UNESCO World Heritage site, as the report suggests, but it is too early for that now. The idea that the Rijnstrangen is such an exceptional area still has to take root.’
The question is, though, whether this idea is likely to take root, especially among the young. After all, cultural history is traditionally the preserve of the over-55s, isn’t it? John Mulder, no spring chicken himself, responds as though he’s been stung. Rubbish. OK, he admits, it might not be so easy to interest young people in the finer details of historic field patterns. ‘But just ask them: where would you rather go shopping, in Amersvoort or Almere? The vast majority will go for the historic city centre of Amersvoort. That is somewhere where you are immersed in cultural history. In the countryside too, cultural heritage contributes to a local identity and colour, and people are proud of their district. And that is appreciated, by young people as well.’

The Dutch-language report *Key to the past; key to the future – the rich cultural history of the Rijnstrangen as a driving force in economic revival. An evaluation of qualities and opportunities* can be found at www.gelderland.nl ■

A skip train **shows how the old kilns worked.**

A fortification that is now in use as **a winery.**

The Rijnstrangen research area



BRINGING CULTURAL HISTORY TO LIFE

Crumbling or even totally lost pieces of cultural history can sometimes be revived by means of 'transposition': retaining cultural history while putting it to contemporary uses. This sort of thing has gone on for centuries: old river inlets or pools gained new functions as part of a defence canal, for example. According to the report's authors, there are also modern ways of drawing more attention to cultural history, even if they only provide a glimpse or a faint echo of the lost heritage. An art work featuring sails, for example, at a spot where a mill once stood, a barn converted into a house, or a defence construction that now forms a footpath. 'Attention to cultural history does not have to mean restoring things and keeping them the way they were', says John Mulder. 'The point is to preserve an identity, but the Netherlands is not an open-air museum.'

'It has to be a kind of dream come true for the entrepreneur'

The remains of brick kilns are integrated into a **rambling route.**

The flooded chapel gets a new lease of life in the **playground.**

Clean water on the cheap

The Thiopaq, a purification plant for biogas developed by Wageningen UR and Paques, is making wastewater purification much cheaper. Dutch waste water treatment company Industriewater Eerbeek recouped its investment costs in no time. **TEXT AND PHOTOGRAPHY** HANS WOLKERS

Purifying wastewater is a complex process involving many steps. Bacteria, gravity and chemicals such as sodium hydroxide all play a part in the purification process. Industriewater Eerbeek BV purifies the water from three local paper factories. 'First we extract the sludge from the dirty water by letting it sink to the bottom, after which we put it in the incinerator', says Jan Moorman, head of technology. 'Then an army of bacteria gets to work on the contamination in the water.' The company converts around 12 million litres of industrial wastewater into virtually clean water every day. Anaerobic bacteria play a key role in the purification process; they are able to convert three quarters of the contamination into biogas. This is a smelly mixture containing methane and the notorious hydrogen sulphide, H_2S. Biogas is an excellent energy source, but the H_2S does need to be removed first. That is a piece of cake for chemists: they bubble the biogas through a sodium hydroxide solution in what are known as scrubbers. This old-fashioned method dissolves the H_2S in the alkaline solution, where it is then converted into sodium sulphate. This salt is bad for the environment as it leads to eutrophication and salination of water.

Industriewater Eerbeek had a world first in 1993 when it installed the first commercial application of the Thiopaq, a purification plant for biogas developed by the Wageningen professor of Environmental Technology Cees Buisman in partnership with the firm Paques BV. It soon proved to be a wise decision. The plant was able to purify the raw biogas more cheaply and more effectively than the old gas scrubbers thanks to the efficient bacterial conversion of H_2S.

'Nearly all the H_2S turns into high-quality, fine sulphur'

SULPHUR HAS MARKET VALUE

'The bacteria are able to convert more than 99 percent of the H_2S in the raw biogas into fine, high-quality sulphur in a single step', says the inventor Cees Buisman. 'It is not easy to produce this form of sulphur by other methods and it actually has market value, unlike the residual products from the old technology.' Not only did the environment benefit considerably, the sodium hydroxide costs also fell by more than 90 percent. That means annual savings of more than 130 thousand euros. 'So we recouped the investment costs of around one hundred thousand euros in less than a year', says a pleased Moorman.

Global sales of the Wageningen installations have already topped one hundred and they are still selling. 'The technology is marketed by Paques BV and Shell. They have just set up a new joint venture, Paquell', says Buisman. Paquell sells an extra-large version of the Thiopaq, which is used to extract sulphur from natural gas on a large scale. 'It is really rather impressive that the chemical industry is using a technology based on a bacterial conversion process invented in Wageningen', says Buisman. ■

The promise of the nitrogen-fixers

Professor Ken Giller is promoting the use of beans and peas among African farmers. With the help of certain bacteria, these crops do not require nitrogen fertilizer. In Wageningen, professor Ton Bisseling is researching the finer details of this symbiosis.

TEXT MARION DE BOO **PHOTOGRAPHY** CORBIS **ILLUSTRATION** SEBASTIAAN DONDERS

It is as hot and humid as a tropical rainforest in this Wageningen greenhouse. The plants are being sprayed with a fine mist of water droplets and the thermostat is at 20 degrees. On a table stand pots of bright green saplings with stringy branches, ugly flowers and green, unripe seeds. They are exemplars of *Parasponia andersonii*, from the tropical rainforests of Papua New Guinea.

Parasponia is a true pioneer plant in the rainforest. It is the first plant to appear when a tract of forest has been razed to the ground, and it wastes no time, growing three to four metres per year. Its secret weapon –discovered in 1973 – are its root nodules inhabited by nitrogen-fixing Rhizobium bacteria. Their presence enables the tree to extract nitrogen, an essential nutrient, from the air: the same trick as is performed by leguminous plants such as beans, peas, soya and clover. 'Parasponia is the only non-leguminous plant that knows how to fix nitrogen', says professor of Development Biology Ton Bisseling of the Laboratory for Molecular Biology at Wageningen University, part of Wageningen UR. 'This extraordinary characteristic seems to have appeared in the plant kingdom twice in the course of evolution.' Just before Christmas, Bisseling managed to obtain a research subsidy of 2.5 million euros from the European Research Council in order to explore the deeper secrets of biological nitrogen fixing.

The Wageningen researchers are going to compare Parasponia's genes with those of a related species, *Trema tomentosa*. Trema bears a remarkable resemblance to Parasponia but once you uproot the tree, you see that it has to make do without root nodules and without nitrogen-fixing bacteria. So where exactly does the difference lie? Why can Parasponia fix its own nitrogen, while its relative Trema cannot? An answer to this question could eventually contribute to a sustainable world food supply, with crops that are able to meet their own nitrogen requirements without the help of expensive, energy-guzzling nitrogen fertilizer.

PHOTO GUY ACKERMANS

TON BISSELING,
Professor of Development Biology, Laboratory of Molecular Biology Wageningen University

'If we can optimize the symbiosis there is more chance of successfully creating green belts in the Sahel'

ESSENTIAL BUILDING BLOCK

Plans and other living organisms cannot grow without nitrogen, an essential building block in all kinds of molecules, including the amino acids that make up the proteins in plants and animals. Our atmosphere is made up of 79 percent nitrogen, but most organisms are unable to make use of that free nitrogen gas. The atoms in one molecule of nitrogen gas (N2) are very strongly connected with a triple bond. Only certain species of bacteria possess special enzymes with which they can convert that gas into ammonia (NH_4^+) and then into other nitrogen compounds that the plant can use. For roughly the last 100 years, we have known how to make nitrogen fertilizer out of free nitrogen. 'But it takes an awful lot of energy to do this. It is done under high pressure at a high temperature', says Bisseling. 'At least 30 percent of the energy costs in agriculture come from the production of nitrogen fertilizer.'

An alternative to nitrogen fertilizer is to grow leguminous crops, which are self-sufficient thanks to their root nodules. The nitrogen-fixing bacteria that lodge there provide the plant with the nitrogen compounds it needs in exchange for sugars manufactured by the plant. Because leguminous plants are so well supplied with nitrogen through this symbiosis, their seeds are exceptionally rich in protein.

Worldwide, there are more than 19,000 species of leguminous plants in a wide range of habitats, from the savannah to the tropical rainforest. Among the first crops that humans began to cultivate for their protein about 12,000 years ago were soya (in China), lentils (in the Middle East) and beans (in South America). The Romans knew that ploughing in the remains of legumes improved soil fertility. If you grew peas first and then wheat, you got a better wheat harvest.

In the course of evolution, genetic changes took place that made nitrogen fixing possible. 'Our first aim as researchers is to learn to understand that', says molecular biologist René Geurts, who will be leading the Parasponia-Trema research project in Bisseling's group. 'Once you have figured

> ‘We want to teach this tree to bind nitrogen itself’

out that mechanism, you might be able to transfer it to other plant species’, says Geurts. ‘As early as 1917, the idea was raised of providing non-nitrogen-fixing crops such as potatoes or wheat with root nodules full of nitrogen-fixing bacteria. In practice the development of genetically modified food crops is fraught with complications. Applications in forestry may be feasible sooner, perhaps in the form of new poplar species that generate their own nitrogen.’

COMPARING GENES

In the legume family, the characteristic of fixing nitrogen probably developed well over 50 million years ago, perhaps several times. In Parasponia it happened much more recently, perhaps 10 to 15 million years ago. According to Geurts, there are about 15 species of Trema, found in a wide range of habitats. Parasponia, by contrast, only grows on mountain slopes and volcanic ash in south-east Asia. ‘I think Parasponia is really a mutated Trema. The genetic mechanism may not be too complicated, and may consist of just a couple of changes. It will be very interesting to compare the genetic make-up of Parasponia with that of the legumes. We hope doing that will enable us to home in on what is useful and get to the heart of the symbiosis. Research on a tropical tree of this kind is not all that easy, but we have tissue cultures of Parasponia here in the laboratory, and we are doing tests on those. We hope to teach Trema to fix nitrogen itself within five years.’

Bisseling has his eye on another interesting nitrogen-fixing plant besides Parasponia. During an excursion in the Saudi Arabian desert for the University of Riyadh, >

PHOTOS ANP AND CORBIS

Planting nitrogen-fixing crops in Senegal. A farmer examines the plant’s nitrogen-fixing root nodules, to which Rhizobium bacteria have been added.

> ‘We look for the most promising crop for each region’

where he is part-time professor, he discovered a fascinating leguminous pioneer plant called *Indigofera argentea*, which manages to survive in the burning hot, barren sand. This plant could well provide a key to making dry desert soils more suitable for trees and shrubs. This could make Indigofera very useful in the African plan for a kilometres-long ‘green wall’ of trees and shrubs to traverse the Sahel and stop the desert from spreading further southwards. Bisseling: ‘Indigofera appears to be very well equipped to withstand extreme desert conditions. The plant works together with drought-resistant Rhizobium bacteria which can apparently survive in the extreme heat and drought of the desert. If we can optimize the symbiosis under such extreme conditions as these, then there is more chance of success in creating green belts in the Sahel, where soils are generally nitrogen-poor.’

STAYING IN CONTROL

Symbiosis in the plant kingdom is an age-old phenomenon. Besides the plants that live symbiotically with Rhizobium bacteria in root nodules, there are also many plant species that cohabit with mycorrhiza fungi, which help the plant to extract water and nutrients from the soil in exchange for sugars. This collaboration is thought to be at least 400 million years old, going back to before the formation of plant roots even, according to fossil research.

In order to play the symbiosis game successfully, the plant must stay in control. Otherwise, fungi or Rhizobium bacteria would overrun the plant cells in no time and suck them dry. To avoid this, the plant protects itself with a specialized membrane. It controls precisely which substances get through this membrane: certain sugars are allowed out and certain nitrogen compounds are allowed in.

It is now known that free-ranging Rhizobium bacteria make their presence felt by giving off certain signal substances, the Nod (nodulation) factors, in the vicinity of the plant roots. The plant roots recognize these signals through their special Nod factor receptors, which trigger the production of root nodules in which the bacteria settle. Researchers can recreate these nod factors in the laboratory. Plants which are exposed to the signal substances in the laboratory immediately create root nodules. Bisseling: ‘By now we know all the main proteins and plant hormones needed in order to recognize and pass on the Nod signal.’

ANCIENT MECHANISM

The age-old mechanism triggered by the Rhizobium bacteria was already being used by mycorrhiza fungi half a billion years ago. ‘This mechanism and the genes that go with it are present in most plant species’, says Bisseling. ‘That gives us reason for optimism about the potential for using symbiosis with nitrogen-fixing bacteria in agriculture in future.’

Parasponia has just the one Nod factor receptor, which is still young in evolutionary terms. In leguminous plants, numerous different receptors have developed in the course of evolution, with very small changes every time. These extra accessories have brought about all sorts of optimal combinations, so that each plant species co-exists with its own specific strain of Rhizobium bacterium.

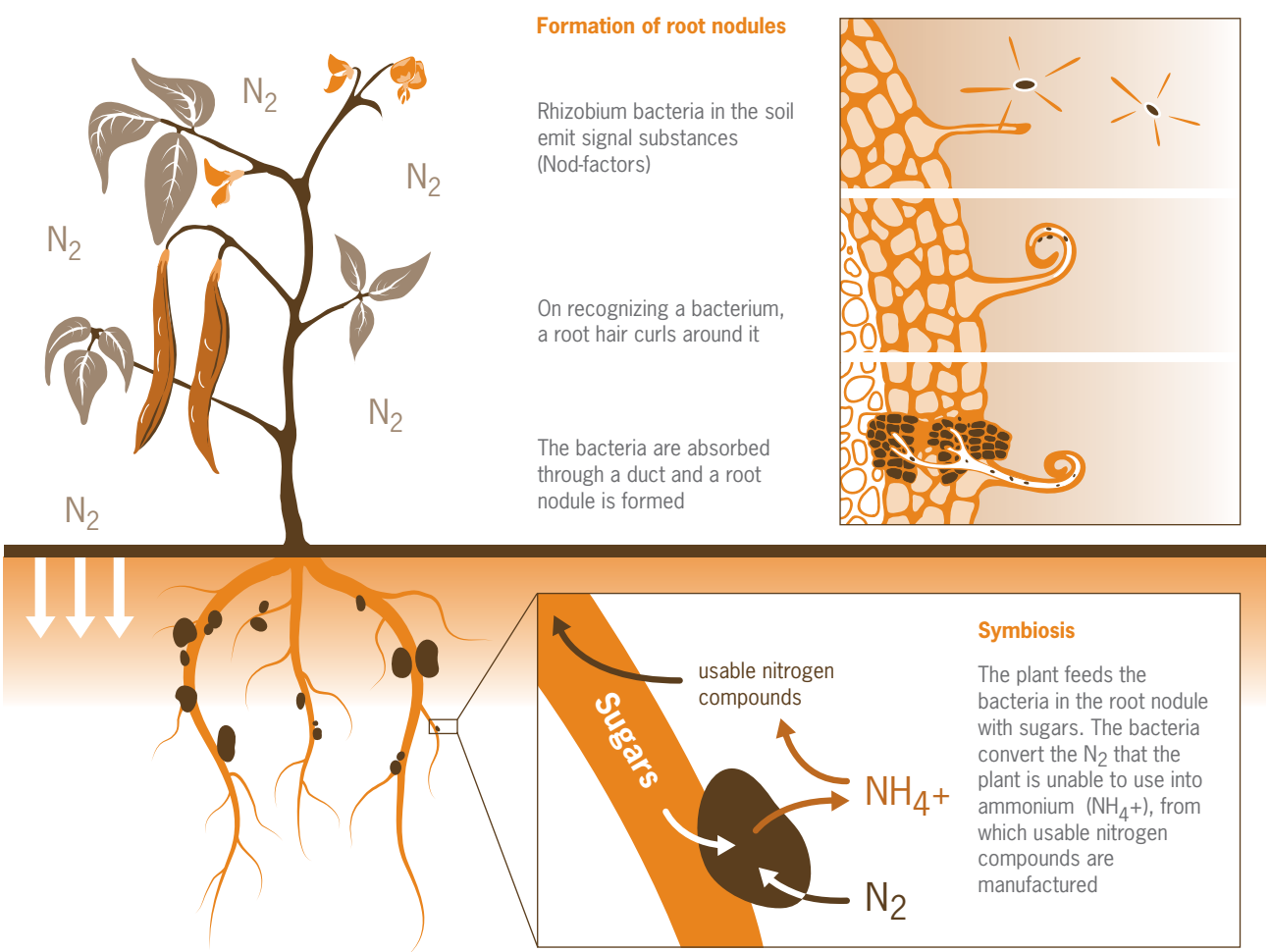
Bisseling has been doing research on Rhizobium symbiosis for 35 years. He expects a breakthrough soon. ‘Thanks to technical progress, the genome of many plants can now be mapped in fantastic levels of detail for a few hundred thousand euros. We already have the data on four legumes: soya, alfalfa, lotus and Cajun peas. But it will take us a little longer to interpret all the biological information that is now suddenly coming out of the genome research.’

BLACK MAGIC

Two storeys higher in the same university building, professor of Plant Production Systems Ken Giller’s research group is working on the N2Africa project to find out how leguminous crops could increase both food production and soil fertility for small-scale farmers in Africa. Giller himself has been working in Africa for 25 years. His N2Africa project is a consortium of researchers and development organizations from all over the world. The aim of the project is to improve the standard of living of at least 200,000 small-scale farmers in more than 10 African countries through the cultivation of pulses. The Bill & Melinda Gates gave the project 19.2 million dollars two years ago, and added another 1.3 million recently. The Howard G. Buffet foundation is also supporting N2Africa to the tune of 2 million dollars.

Much research goes into the selection of the right strain of Rhizobium bacteria for each crop. Giller puts a couple of plastic bags from Zimbabwe down on the table. Each bag contains 400 grams of finely ground turf mixed with enough Rhizobium bacteria to treat 100 kilos of seed. Using this ‘inoculant’ boosts harvests spectacularly. Local farmers talk of ‘black magic’. The method is very cheap and the inoculant

NITROGEN FIXATION IN LEGUMES



is produced locally. The turf stops the Rhizobium bacteria from drying out. Given the right inoculant and a little bit of phosphate fertilizer, a strong variety can easily double or even quadruple its yield. So the farmer's investment pays off very fast.

What is more, the leguminous crops improve the soil, which means that after the bean harvest, the maize harvest will be better too.

'We are looking for the most promising crop for each area', explains Giller's colleague Linus Franke. 'In northern Nigeria and in the Sudan savannah, the climate is very dry and the soils are sandy. The growing season is only three months long, due to lack of rain. There we introduced the yardlong bean, a productive crop that >

PHOTOS N2AFRICA

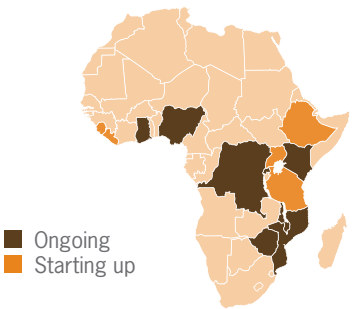
The use of extra Rhizobium bacteria leads to a spectacular increase in both nodule formation and yields.

N2AFRICA

Ken Giller works on the N2Africa project with a consortium of researchers and development organizations from all over the world. The aim is to improve soil fertility and food production among Africa's small-scale farmers.

The project addresses the entire value chain from producer to buyer. Its activities include identifying and introducing the most successful crop for each region, selecting the right Rhizobium bacteria strain for each crop, improving soil fertility by cultivating legumes, developing a market for pulses and introducing new processing techniques.

Giller works on the cultivation of pulses in eight African countries: the Democratic Republic of Congo, Ghana, Kenya, Nigeria, Malawi, Mozambique, Rwanda and Zimbabwe. Five new countries will also be included in the project: these are Ethiopia, Liberia, Uganda, Sierra Leone and Tanzania.



> ‘Those climbing beans are spreading like wildfire now’

flourishes under these dry conditions.’
In Northern Nigeria, new varieties of peanuts have also been tested, including in Kano State, one of the most densely populated regions of Africa. 23 percent of the children and 15 percent of the women in this state are undernourished. A household, which in this context means an extended family with an average of 15 people, has to eke a living from no more than a couple of hectares of land. There is a long tradition of growing legumes for home consumption, but they are now increasingly being grown for the market. The peanut varieties introduced by the project contain more oil and also produce many large seeds. The women are now producing their own oil by pounding the peanuts with a large pestle. The residue is fried as a snack. The peanuts provide not just protein but also several important minerals. Demand for the new varieties runs high, therefore, and people come from far and wide to buy them.
In northern Rwanda, farmers traditionally grew only low-growing bush beans. ‘Introducing climbing beans from cool regions of the Andes has doubled the harvest’, says Giller. ‘Climbing beans go on growing longer and grow higher, so they make better use of the growing season and the available light than bush beans do. But climbing beans do need canes to grow up, and where do you get those from? We’ve thought up all sorts of solutions to that one, including maize stalks, branches of trees or stalks of elephant grass grown for the purpose on the edge of the bean fields. Those climbing beans are spreading like wildfire now.’
Climbing beans do like fertile soils with good water retention and sufficient phosphate. ‘Most African soils are phosphate-poor, and without fertilizer the beans give very low yields on poor soils’, says Franke. ‘That is why we have demonstrated how much you can improve the bean harvest by using manure from the guinea pigs and the rabbits that are kept in the villages. Every little helps. A family of more than ten people here often only has a small plot of land of 0.2 hectares from which to scratch a living.’

WELL ORGANIZED

According to Franke, Africa is importing more and more soya, another legume, particularly for use as feed in the fast-growing chicken industry around the big cities. ‘I think Africa could become far more self-sufficient by increasing its own production of soya. But it is a major challenge to organize that properly so that African soya can compete better with imported soya. In Nigeria, we have been putting a lot of work over many years into breeding soya varieties that are adapted to local conditions. And with great success. All sorts of soya products are now for sale on the roadsides. At the same time, farmers are increasingly successful in supplying the ever-growing chicken industry with soya’, says Franke.
Giller: ‘Ultimately, we are primarily researchers. We work on institutional questions such as how you solve all the new problems that come up when you upscale a pilot to create a bigger project with 1,000 farmers. How do those farmers get access to the Rhizobium inoculant? How do you prevent their soils from being exhausted, and how do you make soils depleted by years of maize farming fertile again? How do the farmers get access to the market and how do you develop new markets for pulses? Our research looks at the money flows all along the value chain, from the farm to the customer.’
The key questions are: where do the opportunities lie for introducing pulses and the relevant new processing techniques, and how applicable is conventional knowledge under local conditions? ‘Large-scale projects such as N2Africa provide great opportunities to conduct comparative studies on the different regions of Africa. In the course of our fieldwork we developed a scientific model for the whole value chain. Now organizations such as the Bill and Melinda Gates Foundation are taking Africa’s problems very seriously. So I am definitely optimistic about the future of African agriculture!’ ■

PHOTO GUY ACKERMANS

KEN GILLER,
Professor of Plant Production Systems at Wageningen University

‘I think Africa can become more self-sufficient by raising its soya production’

Racing through the DNA

Wageningen scientists are able to decipher genetic material in no time thanks to two new DNA sequencers. One of them operates 25 thousand times faster than the equipment of fifteen years ago.

TEXT ALEXANDRA BRANDERHORST

'Today, I sequenced more DNA than I managed in the last six years put together', realized researcher Elio Schijlen after working with the Illumina HiSeq 2000 for the first time. This new sequencer is able to unravel an entire human genome in an afternoon. In the late nineteen nineties, this operation required several machines and took fifteen years, says Schijlen, an expert in next-generation sequencing at Plant Research International, part of Wageningen UR. 'I personally started deciphering DNA in 2004 and even that was the Stone Age compared to today.'

Things have changed now, thanks to two brand-new sequencers - worth 1.7 million euros between them - which Wageningen UR has purchased through CAT-AgroFood, an initiative of the Ministry of Economic Affairs, Agriculture and Innovation, the province of Gelderland and Wageningen UR. At present the sequencers are used mainly by Wageningen UR and the biotech firm KeyGene. Other firms are also able to make use of the facilities, which were presented to interested parties on 16 February.

SCRUTINIZED

At first glance a non-expert would think the Illumina HiSeq 2000 was an ultramodern photocopier. It is a plastic box with a screen showing a black surface and green flickering specks. Those specks represent the four base pairs - A, T, C and G - that are the building blocks of DNA. DNA sequencers decipher the order in which these building blocks are put together. The fragments of DNA that are being scrutinized are on a microscopically small slide and they are invisible to the human eye. They are read by a tiny camera and a laser in hundreds of millions of simultaneous reactions.

A little further along is a more primitive machine, a precursor to the speedy new one. 'It's an ABI from the end of the 1990s, when it was state of the art', says Schijlen. 'We still use the ABI to verify small pieces of material.' The ABI is able to decipher nearly 1 million base pairs a day while the new Illumina can get through 25 billion base pairs in the same time. The model that came between those two is still there too: a sequencer from 2007, capable of processing 500 million base pairs a day.

FITTING JIGSAW PIECES

Schijlen is now using the speedy Illumina to unravel the genomes of 150 tomato varieties. 'That was simply not possible before; it would have taken years and have cost far too much.' The scientists are using the sequenced DNA to look for genetic variations that affect the taste or the resistance to disease and drought. This knowledge will speed up tomato breeding in future and make it more effective.

However, the problem with tomatoes is that the hereditary material consists of many repeated bits of DNA. A genome can only be deciphered in pieces, after which computers try to put the unravelled pieces back together again. Schijlen: 'Sequencing is a lot like doing a jigsaw puzzle. It takes you longer to do a puzzle consisting of thousands of tiny, similar pieces than a puzzle with a hundred large, distinct pieces.'

The second new sequencer - the PacBio RS - is the ideal solution for the large jigsaw pieces. It uses an entirely new method to analyse DNA sequences. While the Illumina is only able to read DNA pieces with up to 100 base pairs, the PacBio can unravel fragments with several thousand base pairs. So it is doing larger pieces. On the other hand, the PacBio is only able to decipher 50 thousand fragments in a single analysis rather than hundreds of millions. That is what makes the combination with the high-speed Illumina so powerful, says Schijlen. 'The best option is to have several different technologies available so that you can exploit the best aspects of each technology.'

The PacBio RS is still in the test phase. Schijlen will be trying it out with the known but still incomplete tomato genome. Then it will probably be possible to fit the jigsaw pieces that are still missing. ■

PHOTO BART DE GOUW

A researcher places a slide with DNA in the sequencer.

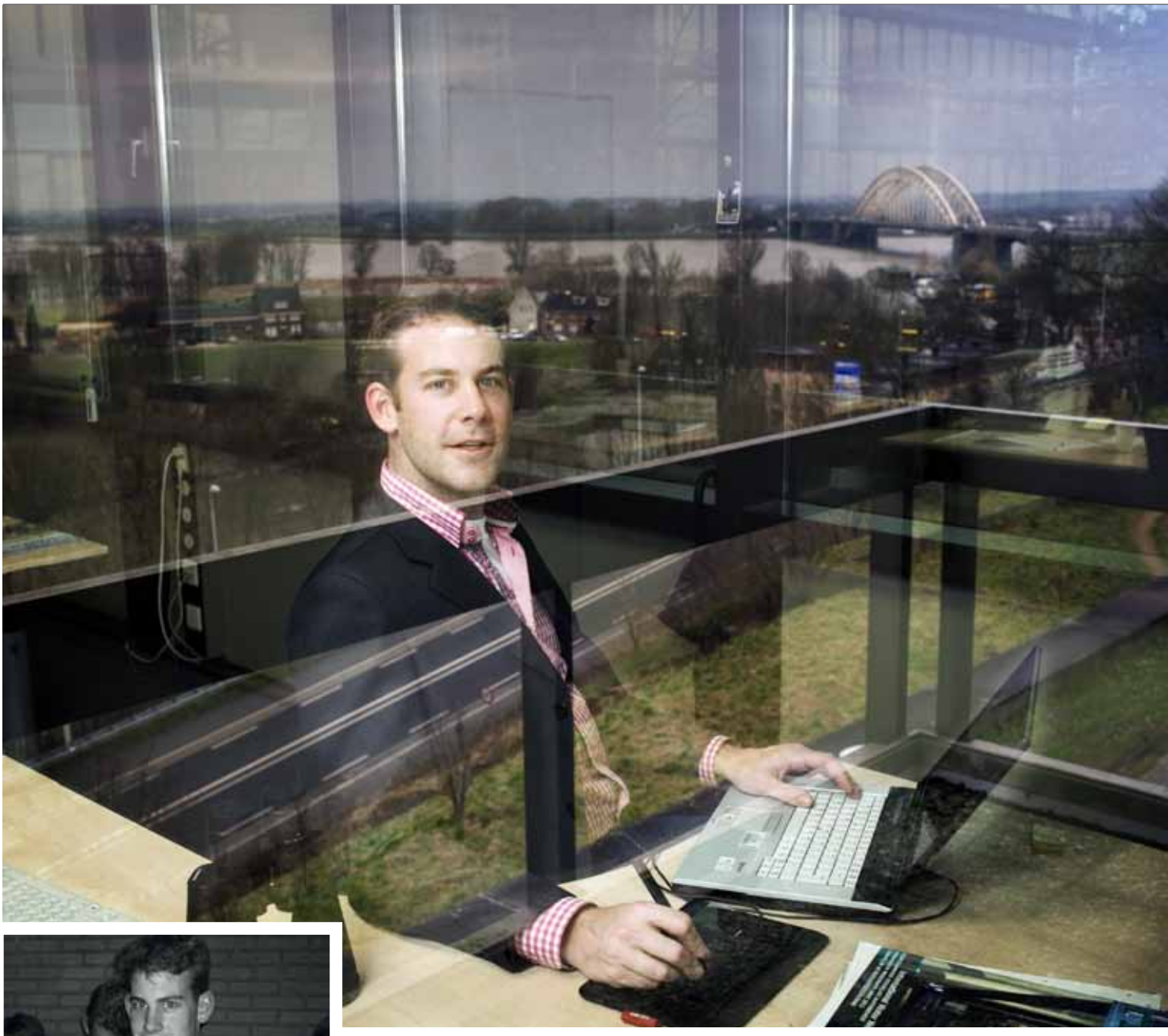
SCANNED BASE PAIRS PER DAY

1,000,000 in 1997

500,000,000 in 2007

25,000,000,000 in 2012

25,000 x faster
15 years on



TJEERD DRIESSEN

Age: 27
Studied: Soil, Water, Atmosphere, 2002 – 2009
Works: as a hydraulic and hydrological engineer for Royal Haskoning

‘In the Netherlands it can often take two years before the diggers go into action’

SOIL, WATER, ATMOSPHERE 10 YEARS ON

Guiding water and chasing tornadoes

One of them channels water in the right direction, the other is an aviation meteorologist and spends his spare time chasing hurricanes and tornadoes. Ex-student mates Rutger Boonstra and Tjeerd Driessen only graduated a few years ago, but have already gained invaluable experience. **TEXT** ALEXANDRA BRANDERHORST **PHOTOGRAPHY** HARMEN DE JONG

'We were standing on a viaduct on the Texas coast. When the hurricane hit land, there was a storm tidal wave and the coastal area was flooded. In the lull when the eye of the storm was passing over, we saw that the viaduct had become an island. A whole village drifted past on the water that surrounded us. Houses, boats, everything. And during the lull, frogs and birds sat side by side on the viaduct, totally knocked out.'

Rutger Boonstra witnessed Hurricane Ike in September 2008, as a member of a team formed by Josh Wurman, familiar from the Discovery Channel series Storm Chasers and founder of the Center for Severe Weather Research. It was a stroke of luck: Rutger was doing an internship at Colorado University in Boulder and met Wurman through his supervisor. When Hurricane Gustav was on its way and Wurman's team wanted to take measurements, one if his team was on holiday so Rutger got the chance to join the trip to Louisiana, where the hurricane would hit land.

A hurricane is a tropical storm often tens of kilometres in size, which brews up at sea and quickly abates once it is over land. Very different to a tornado, Rutger emphasizes. That is a whirlwind with a funnel between a few metres and 500 metres in diameter, and it often dies out quite fast. 'We went to a place from which millions of people were fleeing. It feels strange to be doing something that is actually quite bizarre.' At an elevated spot, the team waited for the hurricane in a probe vehicle, a car full of measuring equipment. 'At first, you can lean into the wind but as the storm picks up strength, you can't get out of the car anymore. And then suddenly the wind drops and you are in the eye of the storm.'

Ten days after Gustav, the team went on to monitor Hurricane Ike. 'No other Dutch person has ever experienced this. Really vicious. Hurricanes are such violent forces of nature; nothing can stand in their way.'

BUILDING DIKES

Whether by coincidence or not, Rutger's mate from his student days, Tjeerd Driessen, came up against the effects of a hurricane on his internship too. He did an internship with Royal Haskoning in 2009. 'The Lower Ninth Ward, a low-lying poor neighbourhood which was covered in three metres of water after Hurricane Katrina, is still largely an expanse of grass dotted with the concrete foundations of houses. I drove through it not long ago.'

Whenever he spoke to New Orleans residents during his internship, whether in the pub or at a football match, they said, 'Thank you for being here.' By 'you', they meant the Dutch engineers who were working on constructing dikes. After his internship, Tjeerd got a job with Royal Haskoning and stayed involved in the New Orleans project. 'Now that coast has the biggest surge barrier in the US.'

From this enormous flood barrier just east of New Orleans, Tjeerd watched a few months ago as rocks were placed in the water to protect the soil from the fast-moving currents. Two weeks earlier, Tjeerd was testing the soundness of the design for this at his desk. 'That way, you see what you are doing it for straightaway. In the Netherlands it often takes two years before any soil is shifted, but in America things move fast.'

During his degree course, Tjeerd opted to focus on water because it is so visible. He specialized in the hydrology of watersheds. >

‘No other Dutch person has ever experienced this’

‘You can see the dynamics and the movement’, he explains, pointing at the River Waal, of which he has a good view from the canteen on an upper floor of Royal Haskoning’s Nijmegen office.
Tjeerd knew from an early age that he wanted to work internationally. As a student, he held various posts, including on the board on the global student organization AIESEC, he did an internship in Sri Lanka and followed a minor programme in Sweden, where he also got some work experience.
Yet most of the projects Tjeerd works on now are in the Netherlands. ‘The bulk of the work consists of hydraulic modelling for interventions in the Rhine delta, calculating the effects of land use plans on the land between the rivers, such as making changes in the water meadows to adapt to water levels and flow rates. Eventually I hope to do more hydrology at well, taking into account the whole watershed.’

JOB OFFER

Rutger works in the Netherlands too, at the Royal Dutch Meteorological Institute KNMI. They were so pleased with his Master’s research that they offered him a job. As an aviation meteorologist, Rutger does the weather forecasts for Groningen and Beek airports and for small air traffic all over the Netherlands, including hot air balloonists, gliders and helicopter pilots. ‘The weather changes all the time, so you have to respond quickly to the current situation. On a summer day with a chance of thunderstorms, small changes in the atmosphere can determine whether nothing comes of it or there is a massive storm.’
Rutger also develops web applications for the weather centre. ‘We work with a lot of data. If I think things could move faster, I start working out what would be the appropriate software and get going on it.
And my applications are really used at the weather centre. My boss sees the advantages of that too.’
Rutger’s fascination with the weather goes back to his childhood. ‘In winter I wanted to know whether it was going to freeze and in the summer I was glued to the window at night, watching the lightning.’ His interest has not waned. With great enthusiasm, he shows a short film of a tornado in Canton in May 2011. Out of a dark grey spinning cloud formation (‘a half mothership’, says Rutger) emerges a funnel. ‘From a distance of 300 metres a tornado formed right before my eyes. At its core, the wind speed was more than 200 kilometres per hour; trees were completely stripped and uprooted.’
Tornadoes are less predictable than hurricanes and more difficult to track down, explains Rutger. The whirlwinds develop from a supercell, a storm that feeds itself with warm, unstable air. Under meteorologically comparable conditions, this sometimes forms a tornado and sometimes does not.
In 2009 and 2010, Rutger took part in the biggest ever research project on tornadoes: VORTEX2, with Josh Wurman as one of the project leaders. In Tornado Valley, which runs from Texas to North Dakota, there are tornado victims every year. The researchers hoped to increase the average warning time of 13 minutes. In the course of VORTEX2, Rutger covered 48,000 kilometres in just over 12 weeks. ‘You cover vast distances. One day you are in Texas, the next day you’re in in Nebraska, then you’re back again the day after that.’

LEAKING DIKES

In 2011, Rutger went chasing tornadoes off his own bat, with some old friends. This meant that he predicted where and when tornadoes could appear. ‘We were very successful. With a group you work extremely hard towards a tough goal. If it works out, you get euphoric.’ Rutger admits that he gets a kick out of extreme weather phenomena. ‘But you do have a big responsibility too. It is fantastic that you are helping to try to reduce the number of deaths caused by these weather events.’
Tjeerd has similarly idealistic motives. His work took him to Azerbaijan, which was struck by floods in 2010. For two weeks he worked with a local dike expert and a driver to record the state of the dike system there, noting measurements and cracks. ‘That was quite tough, in a country where you don’t know the language or the culture. But the need is obvious in a country with leaking dikes. That is a different ballgame to a one and a half millimetre rise in the water level somewhere in the Netherlands, caused by a hawthorn hedge on a campsite.’

WHERE DO GRADUATES OF SOIL, WATER, ATMOSPHERE END UP?

Between 1990 and 2010, 1,846 people graduated from Wageningen with a Bachelor’s degree in Soil, Water, Atmosphere, and a related Master’s degree. Two thirds are Dutch speakers, one third English speakers. We know something about the current work of 777 of the graduates. A large number, 27 percent, work for technical and consultancy bureaus; 15 percent work at research institutes, and 13 percent at universities. Eleven percent work for local government and 6 percent for central government.
Source: KLV Wageningen Alumni Network

Tjeerd expects his profession to become even more international in future, because more flooding is expected as a result of climate change. 'Dutch input in dealing with floods and in making rivers and coasts less vulnerable to the effects of climate change is gaining in importance. That is why we must keep the expertise we have garnered over centuries at a high level.'

For the moment, Tjeerd's university friend Rutger has no more big dreams about meteorology. 'When I was little, I used to watch series about extreme weather on Discovery Channel. Now I have stood in the eye of a hurricane twice, I have chased tornadoes and I am a meteorologist.'

Rutger leaves for the US in May to work on a new research project on tornadoes. 'It was just about possible to fit this in with my work. It is exhausting, mind you: you sometimes drive 16 hours a day, you don't get enough sleep and you eat too much McDonald's food. Next year I might prefer just to go on a normal holiday for once.' ■

RUTGER BOONSTRA

Age: 28
Studied: Soil, Water, Atmosphere, 2002 – 2008
Works: as an aviation meteorologist for the Royal Dutch Meteorological Institute KNMI (and chases tornados)

PHOTOS AQUARIUS

Stinking of fish in a Turkish bus

Fish farms, Turkish dancing, swimming with bluefin tuna and lectures on innovations: all in all, the trip to Turkey and Rhodes organized by the Aquarius study association was a pleasant way to take a peep behind the scenes of the aquaculture industry. 'It's a good opportunity to find out what appeals to you – nutrition, behaviour or the real, die-hard fish farming.' TEXT ALEXANDRA BRANDERHORST

'Back home they keep them in tanks and systems, but there the fish are kept in cages in the sea', explains Petra van Dijk, a Master's student of Aquaculture and Marine Resource Management, talking about the trip to Turkey. The excursion to a fish farm where they breed bluefin tuna, a rare species, made the biggest impression on her, as it did on fellow student Remko Oosterveld: 'Every day they throw about fourteen tons of sardines into a cage with thousands of tuna', explains Oosterveld. 'These fish are about three metres long and incredibly beautiful. It is quite bizarre because they are an endangered species but I am pleased to have seen them', he says. 'One of the workers compared the tuna to cows. They could easily jump out of the cage but instead they just swim around in circles all day.'

The students were also allowed to swim with the huge beasts. 'We stank of fish oil and sardines when we came out of the sea, and there was no chance to take a shower', says Van Dijk. 'Afterwards we were sat in the bus to Bodrum for nearly four hours. We got some funny looks from the other passengers', she laughs.

The excursion was part of the study tour organized by Aquarius, a subsection of the Animal Sciences Study Association 'the livestock farmers'. Its members wanted to attend the annual European aquaculture conference on Rhodes in October 2011. 'So then we decided to see what aquaculture farms there were along the Turkish coast', says Van Dijk. The result was a ten-day study tour with an extensive programme; the travel, accommodation and conference costs were 6,200 euros for the eight participants. The students paid half the costs themselves and the organizers approached companies and the Wageningen University Fund for sponsorship to cover the remaining costs.

DRINKING RAKI

'At a fish farm where they breed bass and sea bream, they used torches to show us the young fish kept inside. Fish farms in the Netherlands would never do that because of hygiene and the stress on the fish', says Van Dijk. Farms in the Netherlands are less open about things anyway, thinks Oosterveld. 'It was very educational. For example, we saw that each farm used a different system to purify the water of feed leftovers and excrement. You see straightaway what the advantages and disadvantages are.'

After five days in Turkey, the students took the ferry to Rhodes for the conference. 'The contacts you acquire during a conference like that make it easier to find a job after graduation', says Pascal Kik, a Bachelor's student of Animal Sciences and chair of Aquarius. 'But the talks about new innovations were also very interesting. A way of combining water purification with growing sea vegetables in sustainable fish farming, for example', says Kik.

Van Dijk: 'It's a good opportunity to find out what appeals to you – for example nutrition, behaviour or the real, die-hard fish farming. Personally I'm not sure yet; I might want to continue with research.'

The study tour was not a holiday in disguise – 'sometimes we had to be on the road by five o'clock in the morning', says Kik – but there was time for relaxation as well. There was the time the group ended up in a cafe in Bodrum with lots of locals. Kik: 'We were given raki to drink and we asked them to teach us Turkish dancing. It wasn't long before everyone in the cafe was dancing with us.' ■

SPONSORING STUDY TOURS

The Wageningen University Fund is keen to see students spread their wings internationally. To this end, the fund uses the student activities incentive scheme to support initiatives such as presentations at international conferences, invitations to international guest speakers or the organization of a study tour – with quality being guaranteed through the participation of a lecturer or the allocation of credits.

The fund is able to sponsor twenty to thirty international student activities every year thanks to contributions from graduates.

Info: www.wuf.wur.nl/NL/Subsidies

'The contacts you acquire make it easier to find a job'

KLV: NETWORKING, KEEPING UP TO DATE AND BELONGING

Results of the KLV image survey

Why do Wageningen UR graduates and students join KLV? The alumni association has its own ideas about that, of course, but do they match what the members say? Trigenum, a specialist research and advice agency, carried out an image study at the end of 2011 in which 1300 people took part.

Trigenum classified the key reasons for membership into a number of categories. The list is as follows:

- 35% mention the networking function: 'to stay in touch with former fellow-students' or 'you're part of a network of (former) students and staff'.
- 19% think that keeping up to date is important: 'it keeps me informed about developments in Wageningen that I wouldn't hear much about at my current workplace'.
- 17% mention the feeling of belonging - solidarity with Wageningen: 'out of loyalty, because I studied there' or 'it means you still feel connected to Wageningen UR'.
- More than 13% refer to the meetings, workshops and training sessions that are organised by KLV: 'because KLV organises interesting, inexpensive courses' or 'I value the content of the activities and meetings'.

Elvire Schlösser, KLV's vice director and the person who commissioned the survey, says: "We're pleased with these results. They fit nicely with our self-image and show that the members are aware of the added value of what we are doing."

Career advice and hints for entrepreneurs were mentioned less often. "We can do a lot for people in that regard," she says. "Maybe these activities are just less well-known?"

What else will KLV be doing this year?

"An example: our biannual address book will be published again this year," adds Elvire. "It's a substantial job, every time. It was mentioned frequently – so it's nice to know that people can't wait to get it!"

You can find more about the image survey on http://bit.ly/xeSJpa

Photo: Guy Ackermans

As part of the light-hearted finale to the Main Conference on 10 November 2011 to celebrate KLV's 125th anniversary, as a way of visualising what KLV stands for, the participants threw balls of wool from one person to another, thus literally creating a web of cohesion.

FORTHCOMING DEBATES

KLV DEBATES: WAGENINGEN SCIENTISTS UPDATE YOU ON CURRENT RESEARCH

KLV is all about for keeping in touch with Wageningen, not only the people but also the research. A lot is going on at Wageningen UR: think of research into improved sustainability or food and health, to mention just a few current topics. To ensure that recent developments are brought to the attention of its broader membership, KLV - together with various partners - regularly organises lectures and debates. We would already like to announce a few of these meetings.

World Lectures' (at Hotel de Wereld)

The planned line-up for the coming spring includes two World Lectures. "People will be brought up to date about recent developments at Wageningen in an informal atmosphere, at an attractive location, and in a relatively small group," says Paul den Besten, KLV's director. "The World Lectures sometimes deal with topics that everyone has heard about, but where only a few people know exactly what is involved, such as algae-based technology or synthetic biology. Or sometimes we just want to stir up a slumbering debate." At a World Lecture, scientists speak about the current research situation. Social concerns will also be covered.

This spring, one World Lecture will be about salinification. The combination of rising sea levels and soil subsidence is increasing the burden of salt water on the western part of the Netherlands. What do we want to do about that - should we keep on pumping, or are we going to adapt? What technical options do we have for saline agriculture, within and outside the dunes? And then there is the social debate: what does salinification mean for (agricultural) entrepreneurs?

Other debates

As well as the World Lectures, KLV cooperates with other parties to organise other types of lectures and debates about hot topics at Wageningen. Take the Science Cafés, for example, which also cover scientific insights and discussions but in an informal pub or café setting. Or the new TEDx, a type of meeting that has come across from the USA.

In May, waste reduction will be the central theme in Wageningen. People who think and act creatively can have their say, in order to inspire others.

"I'd also like to mention two other events," Paul den Besten adds. "In April, we'll be taking part in a debate about the latest scientific insights about cancer. Three of Wageningen's professors will speak about the current state of affairs in their research into the relationships with e.g. nutrition or lifestyle or changes to the sense of taste. Another event in the coming spring is a new series of social café meetings, which we will organise together with Schuttelaar and Partners. Its general theme is the 'New Green Economy', i.e. about entrepreneurship and sustainability."

The Science Cafés and TEDx are held in English. You can find the latest overview of all meetings (in English and Dutch) in the agenda on www.klv.nl. You are welcome to come along.

More KLV news you can read in the KLV Update.
Check our website www.klv.nl/en for our online English version.

ACTIVITIES

Info: www.klv.nl/en
(unless indicated otherwise)

20 March
Young KLV - Worksearch Café
Have you almost completed your education or are you looking for your next contract? Get ready to find your ideal job with a professional career coach.

29 March
Science Café Wageningen
An informal meeting in a cafe with live music, and with a moderator for a lively debate, organized around an interesting scientific topic of conversation.

3 April
Young KLV - Course - CV writing
Personal feedback on your CV with at most seven participants.

26 April
Science Café Wageningen

ALUMNI MEETING

Debating climate change

PHOTO BART DE GOUW

It is never too late to do something about climate change, was Pier Vellinga's message to Wageningen graduates at the end of January. He was one of the speakers at the alumni meeting held at the Triodos Bank in Zeist, the Netherlands.

'There has been an outburst of tremendous scepticism about climate science', says Pier Vellinga, himself a leading climate scientist. When doubt was cast on climate change theories due to errors in the IPCC report, Vellinga wondered, 'Could my colleagues and I have been exaggerating?' An audience of about 100 Wageningen graduates listens attentively. But the professor of Climate Change and Water at Wageningen University (part of Wageningen UR) delivers a convincing story that makes short shrift of such arguments as, 'we had mini ice ages in the past as well.' Using temperature charts and maps of Greenland, Vellinga shows that the prospects really are bleak.

When the earth was 1 to 2 degrees warmer 122,000 years ago, the sea level was an average of 10 metres higher than it is now.
In the Netherlands the problem can be managed fairly well in the long term by raising dikes or by moving to the higher central or eastern parts of the country. But it is different for other countries, warns Vellinga. And sadly, governments do not currently seem capable of addressing the problem.
But it is never too late to do something about it, Vellinga reassures us. 'Three degrees hotter is less unpleasant for earth-dwellers than six degrees.' Technical innovations can achieve a lot in areas such as cutting greenhouse gas emissions and helping us adapt to the effects of climate change. Vellinga: 'But you have to invest first before you get the benefits.'
Triodos Bank is keen to invest in addressing climate change, the audience is told by Itske Lulof. She outlines the key principles of the Triodos funds and then addresses some tricky dilemmas, in the form of a mini parliamentary debate. On such issues as whether you should cover large tracts of land with solar panels, and whether wind turbines should be located in nature areas. The alumni make no bones about their Wageningen background; they back up their opinions with informed arguments.
Alumni meetings are organized by Wageningen University and KLV. For information about meetings in your region: www.wageningenalumniportal.nl

WAGENINGEN UNIVERSITY

Student helps make Science Quiz

Wagenigen Biology student Joli Bastin was glued to the television during the Dutch National Science Quiz this Christmas. But she wasn't just passing the time. Joli was doing a three-month internship with the broadcasting company that created the quiz programme. She wrote articles and thought up questions for the accompanying website (www,wetenschap24.nl). It was not easy, says Joli. 'The answers had to be difficult to Google.'
Joli worked on the junior quiz, including on an experiment on onions developed by Wageningen food technologist Ralf Hartemink. Other Wageningen experts consulted for the adult Science Quiz were Dick Vreugdenhil of the Laboratory for Plant Physiology and Wim van Ieperen of Horticulture Chains. They helped with a question about trees: how come the branches of adult trees growing side by side do not get entangled?
As for Joli, her internship with the broadcasting company has influenced her ideas about her future career: 'It was great. I am definitely going to go into science journalism.'

FUNDS

Animal feed producer donates to campaign

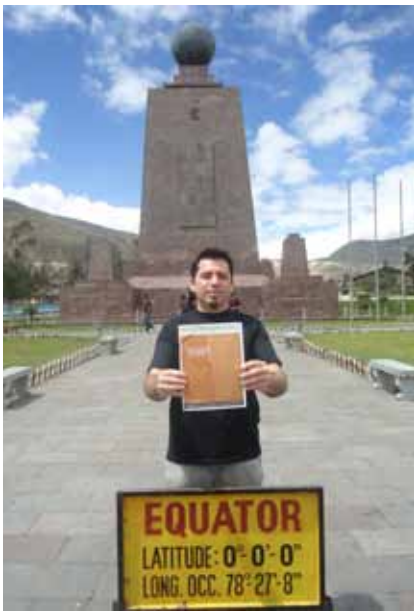
Animal feed producer De Heus Voeders in Ede celebrated its 100th anniversary in 2011 with a donation to the Food for Thought, Thought for Food campaign. The donation will be used to finance doctoral research on the scope for reusing phosphate stored in the soil. Money is also going to the Africa Agribusiness Academy, which supports local enterprise in Africa. This money will be used to run a workshop for 50 African entrepreneurs in Uganda, as well as to launch a business network in Uganda, Kenya and Tanzania.
The Food for Thought campaign was set up by the Wageningen University Fund and Wageningen UR to raise funds for groundbreaking research on solutions to the world food problem. Since October 2010, the campaign has raised more than seven million euros in donations and pledges.

COURSES

Online course on Food Safety

Agrifood products are traded on a global scale, and food safety and hygiene are very important in their production and processing. For this reason, the European chair of Food Safety Microbiology at Wageningen University, part of Wageningen UR, has put together an online course on the key aspects of Food Safety Management. This English-language distance learning programme is intended for students and professionals studying Food Safety, Food Science or Food Technology at BSc and MSc level. It is also suitable for specialists in related areas and those working in the food industry or for government.
Info: www.fhm.wur.nl/UK/education/Courses/ fhm.wur.nl/UK/education/Courses/

WAGENINGEN WORLD



Wageningen in the world!

In December, *Wageningen World* arrived at Degree Zero. Daniel Hidalgo, who is doing an MSc in Biotechnology at Wageningen University, took the magazine home with him to Ecuador. Home is Pomasqui, just north of the capital, Quito, at an altitude of 3,000 metres. Hidalgo emails: 'What you see behind me is the monument that denotes 0 degrees latitude (the equator), so the left part of the magazine is in the northern hemisphere and the right part in the south. Exactly in the middle of the planet!'
Are you, too, reading this magazine faraway from Wageningen? Email the evidence to: wageningen.world@wur.nl

FUNDS

Buddies for international students

The Wageningen University Fund has donated 25,000 euros to a buddy programme that links international students in Wageningen with Dutch students.
This programme is an initiative of IxESN, an organization for both international and Dutch students in Wageningen. International students can join a 'buddy family' with Dutch mentors. IxESN members believe this contact promotes integration and helps international students to soon feel at home in Wageningen. The Wageningen University Fund helps to implement the idea and donates 25,000 euros. The fund donated this amount in honour of its 60th anniversary in 2011, to promote intercultural student life in Wageningen.

IN MEMORIAM

Z. Barre, VHL Forestry and Nature Management student, passed away at the age of 23. 27 December 2011.
A. Bierma MSc, WU Tropical Plant Breeding 1955, passed away at the age of 83.
3 January 2012.
G. Brilman MSc, WU Agricultural Plant Breeding 1955, passed away at the age of 87. 7 February 2011.
P.J. Ente PhD, WU Horticulture 1953, passed away at the age of 85.
17 January 2012.
H.A.J. Hiemstra MSc, WU Tropical Land Use 2000, passed away at the age of 36. 6 October 2011.
S. Hoekstra MSc, WU Plant Breeding 1980, passed away at the age of 59.
9 June 2011.
Hu Zhengjun MSc, WU Crop Science 1997, passed away at the age of 55.
24 December 2011.
G. Kleter PhD, WU Dairy Production 1968, passed away at the age of 71.
2 January 2012.
E.J. Mesu MSc, WU Land Development 1955, passed away at the age of 84. 10 May 2011.
M.T.M. Nijssen MSc, WU International Land & Water Management 2008, passed away at the age of 29.
1 January 2012.
M.L. Oosthoek MSc, WU Household and Consumer Sciences 2002, passed away at the age of 36. 21 November 2011.
D. Pette MSc, WU Forestry 1963, passed away at the age of 79.
18 November 2011.
F.M. van den Putten MSc, WU Horticulture 1958, passed away at the age of 85. 3 September 2011.
Ms P. Sivasubramanian, PhD student in CITE section and WOTRO research team, passed away at the age of 50.
18 January 2012.
A.J.C. Spijkerman MSc, WU Tropical Plant Breeding 1955, passed away at the age of 86. 15 January 2012.
J.J.M. Timmermans MSc, WU Rural Sociology of the Western Regions 1973, passed away at the age of 64.
4 October 2011.
H.D.W. van Tuil PhD, WU Forestry 1962, passed away at the age of 79.
15 December 2011.
A.J. Voortman MSc, WU Rural Economics 1957, passed away at the age of 81. 2 January 2012.
P.G. de Vries MSc, WU Tropical Forestry 1952, passed away at the age of 84. 28 November 2011.
E.B. Wagenaar PhD, WU Horticulture 1954, passed away at the age of 88.
17 June 2011.
H.J. Wezenberg MSc, WU Agricultural Plant Breeding 1952, passed away at the age of 87.
19 December 2011.
J.P.M. van der Wolf PhD, WU Agricultural Plant Breeding 1949, passed away at the age of 85.
11 November 2010.

WAGENINGEN UNIVERSITY FUND

Frits Claassen is best lecturer

FOTO GUY ACKERMANS

University lecturer **Frits Claassen** (WU Zootechnics 1989) was elected Teacher of the Year 2012 in January by a student jury of the Wageningen University Fund. The jury said Claassen enjoys teaching students how to develop their analytical and logical powers. Claassen teaches Logistics, Decision & Information Sciences at Wageningen University, part of Wageningen UR. His courses are very demanding and full of maths but he still knows how to enthuse his students, says the jury.
Claassen was given the bronze figure 'The Tutor', a replica of the sculpture by Jan Praet in front of De Leeuwenborch. In addition he received a certificate and a bonus of 2,500 euros. The other nominees - Jan Willem van Groenigen, Ljiljana Rodic-Wiersma, Huub Savelkoul and Marthijn Sonneveld – also received a bonus of the same amount.

KEEPING TRACK

Wageningen University and the Wageningen Alumni network KLV like to keep in touch with all alumni. Unfortunately, we are missing a few addresses. Do you know the addresses of any of these people? If so, please forward them to alumni@wur.nl. Many thanks!

I.A. Abdelhakeem, MSc, 1999, S19
Abdisalaa Abdilahi, MSc, 1996, S19
Abdirahman Mohamed Ali, MSc, 1998, S11
A. Abel, MSc, 1996, S10
Abraham Mehari Haile, MSc, 2000, S10
A. Abu Agla Ahmed, MSc, 2002, S15
K.A.H. Abu-Hashema, MSc, 1992, S20
S.Y. Abuzeid, MSc, 2000, S19
M. Adan, MSc, 2001, S24
Adas Pereira, MSc, 2000, S22
G. Adilova, MSc, 2001, S22
A. Adin, MSc, 2002, S12
Admasu Alemayehu Dulo, MSc, 2003, S10
P.K. Adraki, MSc, 2005, MAK
Adugna Abreha Hagos, MSc, 2001, S16
G. Aero Kumbi, MSc, 2005, MME
C. Agbo, MSc, 1998, S15
M. Agua Marius, MSc, 1981, S10
A. Aguirre-Gomez, MSc, 1987, S10
Y.B. Agyeman, MSc, 2005, MFN
S.D. Ajere, MSc, 1994, S20
W. Alachew Jembere, MSc, 1994, S16
N. Al-Khudari, MSc, 1973, S10
M. Allebachew, MSc, 2000, S17
R.E. Allen, MSc, 1999, S23
M. Al-Mukdad Ghazi, MSc, 1997, S10
W. Al-Soufi, MSc, 1977, S10
G.S. Amador Saborio, MSc, 2003, S21
G.M. Amatulli, MSc, 2004, S17
Dr. A.Y. Ameloko, MSc, 1977, S10
T.M.Z. Amin, MSc, 1996, S23
R.G. Ampuero Alcoba, MSc, 2005, S22
E. Ananta, MSc, 2004, MFT
Andargachew Bekele, MSc, 1999, S22
M.Z. Andziak, MSc, 2005, MES
G. Anyo, MSc, 1999, S22
M. Arce Moreira, MSc, 2002, S23
R. Ariel, MSc, 2003, S24
E.P. Armando Cavane, MSc, 2000, S11
J. Arroyo Alba, MSc, 1999, S18
F.X. Arullappan, MSc, 1990, S12
Asefa Taa, MSc, 1994, S12
Ashenafi Madebo Hydebo, MSc, 2003, S10
G. Asheri, MSc, 1988, S20
E. Atanaw, MSc, 2005, MME
M. Awriya Ibrahim, MSc, 1993, S13
D.K.C. Bahadur, MSc, 2001, S11
Yuling Bai, MSc, 2001, S12
M.E.I. Bakhit, MSc, 2005, MID
Li Baozhu, MSc, 1991, S10
L.L. Barrera, MSc, 1989, S10
E. Baser, MSc, 2000, S19
A.W. Bassler, MSc, 1997, S16
H. Batomaouakela-Moussassa, MSc, 2003, S15
I.R. Baumgart, MSc, 2000, S12
D. Bechet, MSc, 2004, S26
Belay Teshome Ayele, MSc, 2001, S12
K. Belobradora, MSc, 2006, S17

PERSONALIA

Prof. Ton Bisseling, Radboud University Nijmegen Biology 1975, Professor of Molecular Biology at Wageningen University, part of Wageningen UR, has been awarded an ERC (European Research Council) Advance Grant of 2.5 million euros for his research on nitrogen fixing by non-papilionaceous plants. 17 November 2011.

Prof. Adri van den Brink, WU Land Development 1978, Professor of Landscape Architecture at Wageningen University, has been appointed chair of the Ethics Committee of Wageningen UR. 20 October 2011.

Prof. Wilco Hazeleger, WU Soil, Water and Atmosphere 1994, has been appointed professor by special appointment of Climate Dynamics at Wageningen University. 19 January 2012.

Prof. Ruud Huirne, WU Agricultural Economics 1986, managing director of the Social Sciences Group of Wageningen UR, has accepted the position of director of Food & Agro at the Rabobank. Huirne will remain a professor at Wageningen UR on a part-time basis. 1 February 2012.

Pavel Kabat

Prof. Pavel Kabat, Hydrology and Water Resources 1982, professor of Earth System Science and Climate Change at Wageningen UR, has been appointed director of the International Institute for Applied Systems Analysis (IIASA). 1 February 2012.

Linda Oude Griep PhD, WU Nutrition and Health 2003, has been awarded the 2011 Cover Prize by Resource for the most attractive design for a PhD thesis. 15 December 2011.

Viola Peulen, Diedenoort Academy Consumer Communications 1984, Corporate Director of Communications & Marketing at Wageningen UR, has accepted the position of Head of Corporate Communications at the teaching hospital Universitair Medisch Centrum St. Radboud in Nijmegen. 1 March 2012.

Prof. Rudy Rabbinge, WU Phytopathology 1971, emeritus professor of Sustainable Development and Food Security at Wageningen University, was awarded a Silver Medal by Wageningen University following his farewell speech. 24 November 2011.

Prof. Evert Schouten, Utrecht University Medicine 1973, is retiring from his position as Professor of Nutrition and Prevention at Wageningen University and as director of the Risk Assessment and Research Programme of the Netherlands Food and Consumer Product Safety Authority. 2 February 2012.

Grace Tan Hui Shan, MSc student WU Nutrition and Health, has been awarded the Unilever Research Prize for her Master's thesis about pine nuts and their ability to distort consumers' perception of flavours for weeks on end. 28 November 2011.

Laan van Staalduinen MSc, WU Economics of Agriculture and the Environment 1992, has been appointed interim managing director of the Social Sciences Group of Wageningen UR. 1 February 2012.

Han Swinkels PhD, WU Zootechnics 1988, has been appointed lecturer in Sustainable Livestock Farming Supply Chains at HAS Den Bosch. 1 January 2012.

Bart Thomma MSc, WU Phytopathology 1996, working at the Laboratory of Phytopathology at Wageningen University, has been awarded an NWO Vici grant of 1.5 million euros. 31 January 2012.

Bastiaan Vermonden MSc, WU Aquaculture & Marine Resource Management 2011, has won the French Jacques Rougerie Prix Architecture, Technologie et Design de la Mer. Vermonden and his French girlfriend Camille Benoit won the prize with their plan to house refugees out at sea. 29 November 2011.

Prof. Johan Verreth, Ghent University Biology 1974, professor of Aquaculture & Fisheries at Wageningen University, has been appointed director of the Wageningen Institute of Animal Sciences (WIAS). 1 January 2012.

WAGENINGEN UNIVERSITY FUND

Thesis prizes

On 9 February 2012, the Wageningen University Fund commended the following five students or former students of Wageningen University, part of Wageningen UR, for their excellent theses or publications.

- **Emma van der Woude BSc**, WU Biology 2010
- **Ingeborg Kluts**, MSc student WU Environmental Sciences
- **Francesco Cecchi MSc**, WU International Development Studies 2010
- **Jelke Fros MSc**, WU Biotechnology 2010 (Publication Prize)
- **Jan Wouter Kruyt**, MSc student TU Delft Aviation and Space Technology, biology application in 2010, carried out within the Experimental Zoology Group at Wageningen University (prize for practical application)

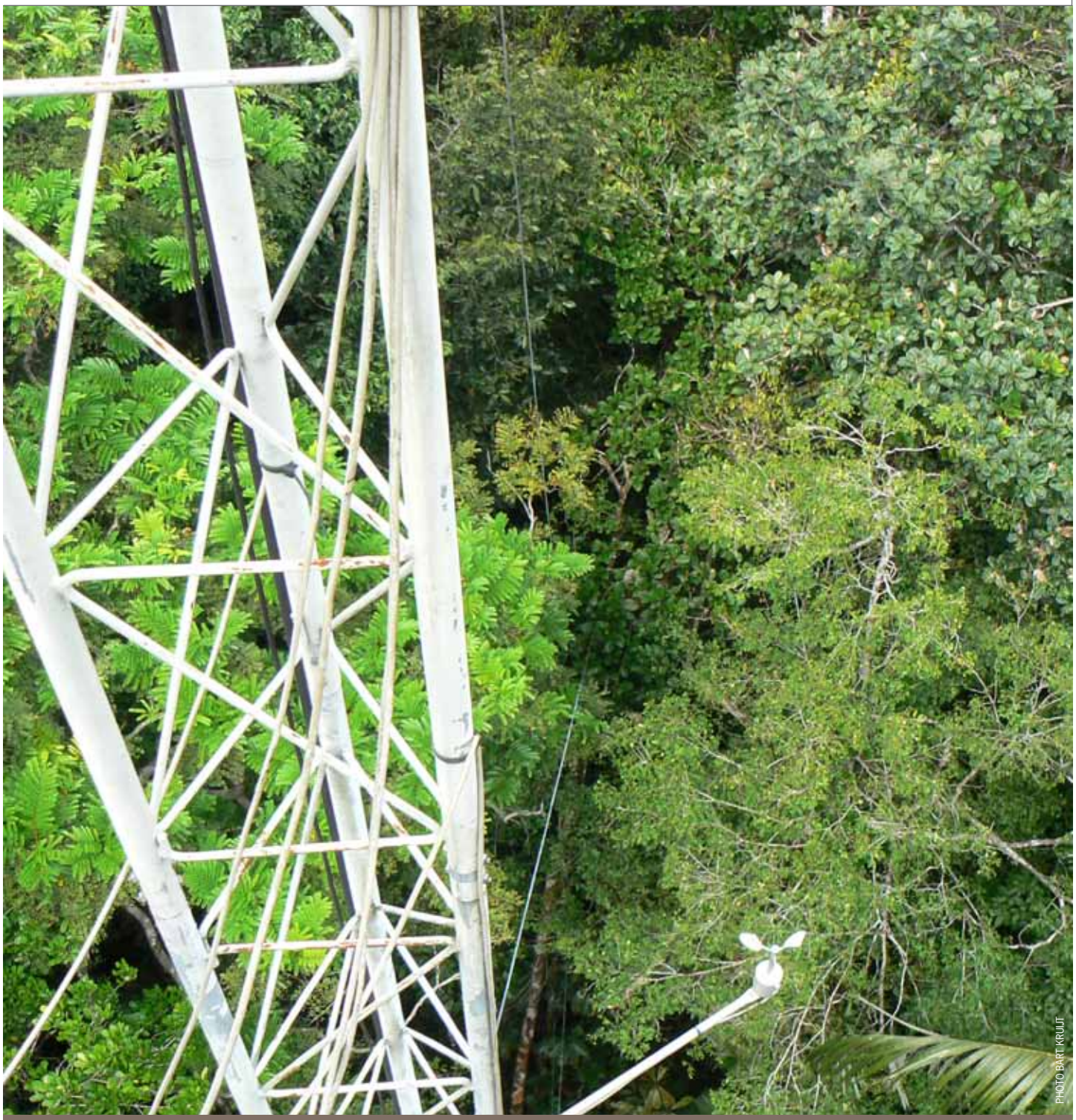


PHOTO BART KRUIJT

Climate research in the Amazon rainforest

'At the end of the nineteen nineties, we were already working with Brazilian scientists on installing research towers to measure the exchange of CO_2 and water vapour between the rainforest and the atmosphere', says Bart Kruijt, researcher at Alterra, part of Wageningen UR. This biophysical research has now evolved into the ambitious Amazalert project in which 14 Western European and South American research institutes are documenting the effects of climate change on the Amazon region, with Kruijt as project coordinator. There are indications that the rainforest in the region will turn into savannah. The question is: is this true, and if so, what changes will it bring with it, in terms of land use and river runoff? And conversely, how do deforestation or land use changes affect the climate? This kind of model, in which projections are made of socio-economic developments together with stakeholders from the region, can eventually also be used to predict the impact of government interventions, Kruijt hopes. 'We aim to develop an early warning system too. Identifying what you need to look out for, which data you need – river runoff perhaps, or precipitation patterns – in order to realize in time that the rainforest is coming under threat. That is important, not just locally, but also for the climate in Europe.'

Info: bart.kruijt@wur.nl ■